Concept 1

The Cell as a System

Lesson 1

Activity 1	*Can You Explain*
Activity 2	*Building Blocks of Living Organisms*
Activity 3	*What Do You Already Know About the Cell as a System*
Activity 4	*Cell needs*

Lesson 2

Activity 5	*Brief History of the Cell*
Activity 6	*Hands-on investigation* *Using a Microscope to View Cells*

Lesson 3

Activity 7	*The Parts of a Cell*
Activity 8	*The Functions of Cell Parts*

Lesson 4

Activity 9	*Comparing Plant and Animal Cells*
Activity 10	*Project Planning a Cell City*

Lesson 5

Activity 11	*Hands-on investigation Build a cell city*
Activity 12	*Record evidence Like a Scientist* *The Cell as a System*
Activity 13	*Careers and Cell Biology*

Lesson 1

Activity 1 Can You Explain

Cells They are the basic units, or building blocks

الخلايا هي الوحدات الأساسية، أو اللبنات الأساسية

Cells are found only in living organisms and not found in non-living organism

الخلايا توجد فقط في الكائنات الحية ولا توجد في الكائنات غير الحية

Cells are **tiny** organisms (**very small**). We need a **microscope** to **see them** cannot be seen by naked eye

الخلايا صغيرة جدًا. نحتاج إلى مجهر لرؤيتها ولا يمكن رؤيتهم بالعين المجردة

Cells function وظيفة الخلايا

Growing Repairing themselves Reproducing
Responding to the environment

النمو- إصلاح نفسها- التكاثر -الاستجابة للبيئة

Activity 2 Building unit of Living Organisms

Put (√) or (x)

1-Microscopes are used to see the structure of cells ( )
2-Living organisms and non-living things are made up of cells ( )
What is the common thing between plants and animals

- **Both plants and animals** are living organisms made of **cells**

• كل من النباتات والحيوانات كائنات حية مكونة من خلايا

- The cells of plants and animals are different in shape and size

• تختلف خلايا النباتات والحيوانات في الشكل والحجم

Cells as Building unit blocks خلايا وحدة بناء

As a **brick** is the building unit of a **wall** or a building, the **cell** is the main **building unit of life**, structure and function of all living organisms on Earth

وبما أن الطوب هو وحدة بناء الجدار أو المبنى، فإن الخلية هي وحدة البناء الرئيسية للحياة والبنية والوظيفة لجميع الكائنات الحية على الأرض


Animal cells Plant cells

Living organisms are different in shape and structure, but all of them are similar in that **the animal cells** differ from **plant cells** in .shape and structure

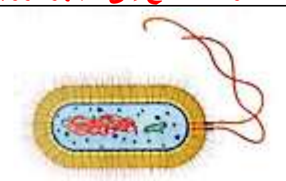
تختلف الكائنات الحية في الشكل والبنية، ولكنها جميعها متشابهة من حيث أن الخلايا الحيوانية تختلف عن الخلايا النباتية في الشكل والبنية.

Cells *are the structural functional, and biological units of all living beings*

الخلايا هي الوحدات الوظيفية الهيكلية والبيولوجية لجميع الكائنات الحية

Size of the Cell

Most cells are very small	**Some cells are very large**
Examples	
Common plant or animal cells *They are between 0.005 and 0.1 mm long.* **Bacteria** *They are usually smaller than this* الخلايا النباتية أو الحيوانية الشائعة: يتراوح طولها بين 0.005 و0.1 ملم. البكتيريا عادة ما تكون أصغر من هذا	**An unfertilized bird egg** *It contains only one egg cell* بيضة طائر غير مخصبة تحتوي على بويضة واحدة فقط
You will need a microscope to see them سوف تحتاج إلى مجهر لرؤيتهم	





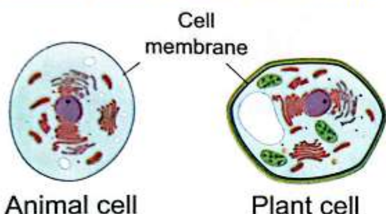


NOTE *The unaided human eye can see objects that are about 0.1 millimeters (mm) long*

يمكن للعين البشرية المجردة رؤية الأجسام التي يبلغ طولها حوالي 0.1ملم

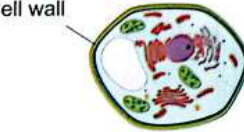
Characteristics of cells *The similarities and differences between cells*

All cells have a cell membrane



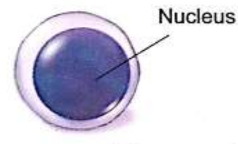
Not all cells have a cell wall





Animal cell doesn't have a cell wall — Plant cell has a cell wall

Not all cells have a nucleus





Animal cell has a nucleus — Animal cell doesn't have a nucleus

The cells of one living organism are not identical





Human muscle cell — Human bone cell

معظم الخلايا صغيرة جدًا ولا يمكن رؤيتها بدون المجهر تصنف الكائنات الحية حسب عدد الخلايا إلى:

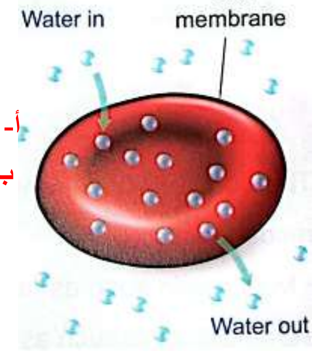
Unicellular organisms كائنات وحيدة الخلية	**Multicellular organisms** الكائنات متعددة الخلايا
Consist of one cell تتكون من خلية واحدة	*Consist of many cells* تتكون من عدة خلايا
Cannot be seen by naked eyes لا يمكن رؤيتها بالعين المجردة	*Can be seen by naked eyes* يمكن رؤيتها بالعين المجردة
Bacterial and Fungi مثال: البكتيريا والفطريات	*Plant, human and animal* مثال: النبات والإنسان والحيوان

Activity 3 Cell Needs النشاط 3 احتياجات الخلايا

During the growth of a living organism, the new cells are formed from cells that were already existed in its body.

* أثناء نمو الكائن الحي، تتكون الخلايا الجديدة من خلايا موجودة بالفعل في جسمه.

What are the needs of the cell? ما هي احتياجات الخلية



A-The cell needs energy *to carry out all its own life activities to survive and get rid of waste materials*

أ- تحتاج الخلية إلى الطاقة للقيام بجميع الأنشطة الحياتية الخاصة بها من أجل البقاء والتخلص من الفضلات

B-The cell needs some materials *such as* ب- تحتاج الخلية لبعض المواد مثل

*1-**Food** (nutrients) and oxygen to get energy*

1- الغذاء (المواد المغذية) والأكسجين للحصول على الطاقة

*2-**Water** to stay alive* - الماء للبقاء على قيد الحياة

How does the cell get its need of water

كيف تحصل الخلية على حاجتها من الماء؟

Water enters the cell through a membrane that surrounds the cell known as "the cell membrane"

- But, if there is much water enters the cell, it will swell until it bursts.

يدخل الماء إلى الخلية عبر غشاء يحيط بالخلية يعرف باسم "غشاء الخلية"

- ولكن إذا دخل الماء كثيرًا إلى الخلية، فإنها تنتفخ حتى تنفجر.

So the cell membrane allows water to go outside the cell to keep the water balance on both sides of the cell membrane (i.e. inside and outside the cell).

لذا فإن غشاء الخلية يسمح للماء بالخروج إلى خارج الخلية للحفاظ على توازن الماء على جانبي غشاء الخلية (أي داخل الخلية وخارجها).

The cells of one living organism are not identical

خلايا كائن حي واحد ليست متطابقة

Human muscle cell

خلية عضلية بشرية

Human bone cell

خلية عظمية بشرية


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Exercises on Lesson one

1- Choose the correct answer:

1. The smallest tiny structures that build up all living organism's bodies are

a. systems b. cells c. organs d. bricks

2-We can see the cell of ………………. without using a microscope

a. bacteria b. plant c. human d. bird's egg

3-The is responsible……….. for the entry and exit of water into and out of the cell

a. cell membrane b. muscle cell c. nucleus d. bone cell

4- The number of cells which build up a baby's body is the number of cells which build up his father's body.

a. more than b. less than c. equal to d. double

5-The structure which is present in plant cell and not in animal cell is

a cell membrane only b. cell wall only

c. cell membrane and nucleus d. cell wall and nucleus

6-The cell needs…………. to get its needed energy and to stay alive

a. oxygen only b. water only

c. food and water only d. food, oxygen and water

7-Growth of a living organism is resulted from increasing the in……… of cells its body

a. length b. size c. number d. mass

8-The body of………….. is composed of one cell only

a. human b. bacteria c. big tree d. an elephant

9-All the following living organisms bodies are build up of many cells except

a. human b. fish c. plant d. bacteria

2-Put (√) or (X)

1- We can see the cells of all living organisms with the naked eye ( )
2. All living organisms are similar in that they are made up of one cell only ( )
3 The new cells are formed from other cells existed in the body of a living organism ( )
4-All animal cells have a nucleus ( )
5-The cells that are present in different living organisms are not similar( )
6-Growth of living organisms depends on increasing the number of cells in Iving organism's body( )
7- The cell get its energy from nutrients only ( )
8-The cell membrane allow water to go inside and outside the cell ( )
9-Cell is the building unit of both living organisms and non-living things( )
10-The cells that build up a fish body are similar to that of onion plant( )

3-Write the scientific term

1. The main building unit of the living organisms body that can do all vital processes (………………..)
2-The component of cell that allows water to enter and exit the cell (……………………..)
3-A device that is used to see the structure of living organisms cells (………………..)
4-Living organisms which contain cell wall in the structure of their cells and most of them have a green color (………………..)

4-Complete the following sentences

1-Some cells may be large enough to see with our naked eye such as…….



2-Plant cell has……………….. which is not found in animal cell
3- Human body cells need food and oxygen to get……..…. which is needed to do all vital processes
4-Your body grows up due to the increase in number of your body………
5-All cells allow water to go inside and outside them through …………..
6-To see the structure of bacteria, we need to use………………..

5-Give reasons for

1. The cell needs energy

…………………………………………………………………………..

2-The cell allows water to go outside it

…………………………………………………………………………..

3-You cannot see the body of bacteria with your naked eye

…………………………………………………………………………..

6-What happens if…………..?

1-There is much water enters the cell

…………………………………………………………………………..

2-The cell doesn't get its needs of nutrients, oxygen and water

…………………………………………………………………………..

3-The number of cells increased in the body of a baby

………………………………………………………………….

7-Look at the opposite figure, then answer

1-This device is called……………….

2-If the examined cell has a cell wall it may be a cell of

a. leaf b. lion's body. c. Human body d. mouse body

3-This device must be used to see the structure of all the following cells except

a. plant cells b. human body cells
c. unfertilized bird's egg d. bacteria cells

8- Look at the opposite figure, which show the structure of different cells, then complete the sentences below

Cell ① (Animal cell) Cell ② (Plant cell)

1-The cell wall is found in cell number ………….. only
2-By examining a part of your skin under microscope you can see the same structure of the cell number……………



Lesson 2

Activity 5 Brief History of the Cell

النشاط 5 تاريخ موجز للخلية

The scientist: Robert Hooke العالم: روبرت هوك

In 1665 (17th century) he used the newly invented microscope to observe some too small things to be seen by the naked eye

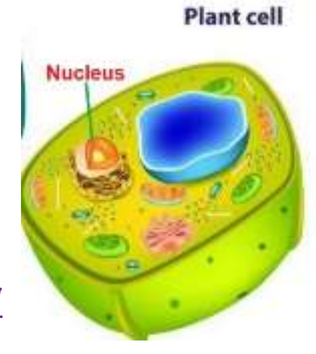
في عام 1665، استخدم المجهر المخترع حديثًا لملاحظة بعض الأشياء الصغيرة جدًا التي لا يمكن رؤيتها بالعين المجردة

He was the first person to use the word "cell

كان أول من استخدم كلمة;خلية

Later, the modern microscopes help scientists to discover more information about the cell and they exchange these information between each other, such as

وفيما بعد ساعدت المجاهر الحديثة العلماء على اكتشاف المزيد من المعلومات حول الخلية ويقومون بتبادل هذه المعلومات فيما بينهم مثل



The nucleus that is found inside many

النواة الموجودة داخل العديد من الخلايا

The different parts of the cell and their functions

أجزاء الخلية المختلفة ووظائفها

The cell is the building unit of living organisms bodies

الخلية هي وحدة بناء أجسام الكائنات الحية

The body of some simple living organisms consists of one cell only

.يتكون جسم بعض الكائنات الحية البسيطة من خلية واحدة فقط

The body of living organisms that contains complex systems consists of many different cells

.جسم الكائنات الحية الذي يحتوي على أجهزة معقدة يتكون من العديد من الخلايا المختلفة

Check your understanding

Complete the following sentences using the words below ▸

(Robert Hooke - exchange information - modern microscope)

1-Scientists can……………. of their researches between each other

2-The first scientist who discovered the cell was………………..

3-Different parts of the cell and their functions can be observed using the………..

Give reasons for علل أسباب

1-Scientists have developed microscopes

To be able to look at small things in more details

1-قام العلماء بتطوير أجهزة الميكروسكوب الرؤية تفاصيل الأشياء متناهية الصغر

2-Scientists used information learned from one another's research

To understand cells better today

يصبح في إمكان العلماء اليوم استخدام المعلومات المستنتجة من أبحاثهم. لفهم الخلايا بشكل أفضل



What happens if ?

The microscope wasn't invented -

Scientists would not be able to discover the cell and its structure

ماذا يحدث لو لم يتم اختراع المجهر ؟ لن يتمكن العلماء من اكتشاف الخلية وتركيبها

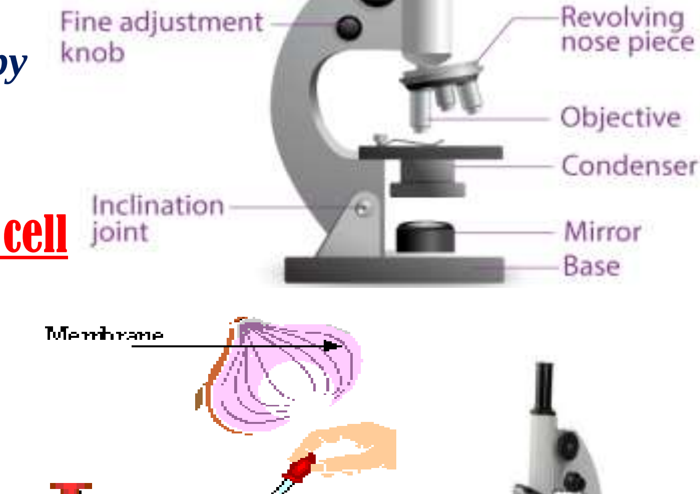
Activity6

Using a Microscope to View Cells

Importance

it magnifies cells that can't be seen by the unaided eye

Structure



Experiment prepare a slide of onion cell

Tools

Slide of skin of an animal
Slice of skin of an onion
Distilled water
Compound microscope
Eyedropper
Coverslip
Glass slide






Membrane

Steps

1-Use the forceps to separate the thin membrane of one of the onion pieces.
استخدم الملقط لفصل الغشاء الرقيق لإحدى قطع البصل

(A) (B) (C) (D)

2-Place the thin membrane of an onion in the center of a glass slide
ضع الغشاء الرقيق للبصلة في وسط شريحة زجاجية

3-Add drops of distilled water to it
أضف إليه قطرات من الماء المقطر

4-cover the slide by the coverslip
ضع الغطاء فوقه بعناية

5-Examine the sample under the compound microscope
افحص العينة تحت المجهر المركب

6-Repeat the previous steps on a slide of skin of an animal
- كرر الخطوات السابقة على شريحة من جلد الحيوان

Observations *When you examine the slide using the*

low power *objective lens*	**high power** *objective lens*
see the cells **small size**	*see the cells in* **bigger size**
عند فحص الشريحة باستخدام العدسة الشيئية منخفضة الطاقة، سوف ترى الخلايا بحجم صغير	عند فحص الشريحة باستخدام العدسة الشيئية عالية الطاقة، سترى الخلايا بحجم أكبر-

Exercises on Lesson 2

1- Choose the correct answer:

1. Microscopes help scientists to discover that ....is the building unit of living organisms bodies

a. brick b. cell c. the Sun d. energy

2. The body of simple living organisms as bacteria consists of

a one cell only. b. different cells c. many cells. d. ten cells only

3. You can see the cells of all the following under microscope, except

a. onion. b. human skin. c. leaf d. stone

4. All the following are from parts of microscope, except

a. eyepiece. b. stage. c. coverslip d. mirror

5. When you examine a piece of onion under microscope using the low power objective lens, you will see the cells of onion in ....size

a. Small b. medium c. big d. very big

6. The modem microscope help scientists to discover all the following information about the cell, except that

a. the cell is the building unit of living organisms bodies.
b. some simple living organisms consists of one cell only.
c. living organisms that contain complex systems consists of many cell
d. all living cells have the same parts which have the same function

2-Put (√) or (x)

1. Robert Hooke used his microscope to observe cells of some samples of plant parts. ( )
2. The body of a living organism that contains complex systems, consists of one cell only( )
3 All objective lenses of microscope have the same focusing power( )
4. The modern microscopes help scientists to discover more information about the cell ( )
5. We can see the examined sample in bigger size when using the high power objective lens ( )
6. The function of coarse focus and fine focus is making the image of sample very clear under microscope. ( )

3-Complete the following sentences using the words below

(low power-objective lenses-the cell-small-living organisms)

1. Robert Hooke named the tiny particles that he saw under his microscope With..................
2. The cell is the building unit of............... bodies
3. Different focusing power of............. allow us to see the components of cells
4. You can see cells of an examined sample in ....by using the size objective lens of the microscope

4 Give reasons for:

1. Scientists tend to use microscopes in their researches

……………………………………………… ………………………………………………………

2. We must rotate the coarse focus and fine focus during examining a sample under microscope

……………………………………………… ………………………………………………………

5-What happens if

1 Scientists was not invented the microscopes

……………………………………………… ………………………………………………………

2. You examine a sample of plant cells using the low power objective lens of microscope.

……………………………………………… ………………………………………………………

6 Look at the opposite figures, then answer the following questions:

1. The opposite figures represent ……….. which are the building unit of a plant.

Figure (1)

2. Which figure indicates that we use the low power objective lens of a microscope? (Give a reason for your answer).

……………………………………………… .

……………………………………………… ……………………………………

Figure (2)

3. Which figure indicates that we use the high-power objective lens of a microscope? (Give a reason for your answer).………………………………………………

……………………………………………… ………………………………………………



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Lesson 3

Activity 7 The parts of a Cell

النشاط 7 اجزاء الخلية

Living organisms are classified according to the number of cells into

Unicellular organisms كائنات وحيدة الخلية	**Multicellular organisms** الكائنات متعددة الخلايا
made up of one cell تتكون من خلية واحدة	*made up of more than one cell* تتكون من اكثر من خلية
Example *Bacterial and Fungi* مثال: البكتيريا والفطريات	**Example** *Plant, human and animal* مثال: النبات والإنسان والحيوان

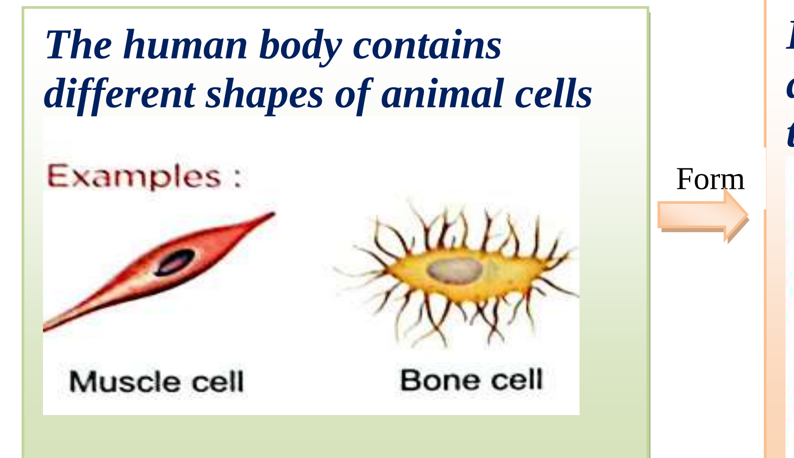
The number of cells in living organisms varies, as follow



Levels of Biological Organization

The structure of most multicellular organisms is organized into five levels

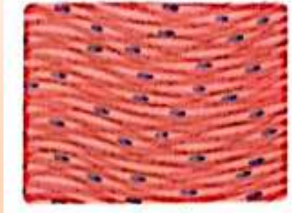
The human body contains different shapes of animal cells



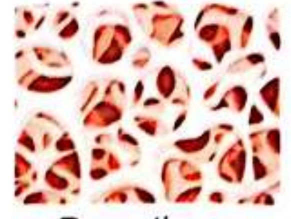
Form

Each tissue is often composed of a group of similar cells that do the same function





Muscle tissue



Bone tissue

Form

Each organ is composed of a group of different tissues to do its own function

Examples :




Heart



Stomach

Form

Each system is composed of a group of different organs to do a certain function

Examples :



Respiratory system



Digestive system

.The human body is composed of a group of different systems -

The human body contains about 40 trillion cells (40 trillion = 40,000,000,000,000)

The Functions of Cell Parts

the multicellular organisms are made up of many cells that differ in shape and structure but, there are some similar parts in their structure
the common parts of most cells such as
Cell membrane - Cytoplasm - Mitochondria - Golgi apparatus
Nucleus - Endoplasmic reticulum - Cell membrane

Cell membrane

It is the outer lining of the cell

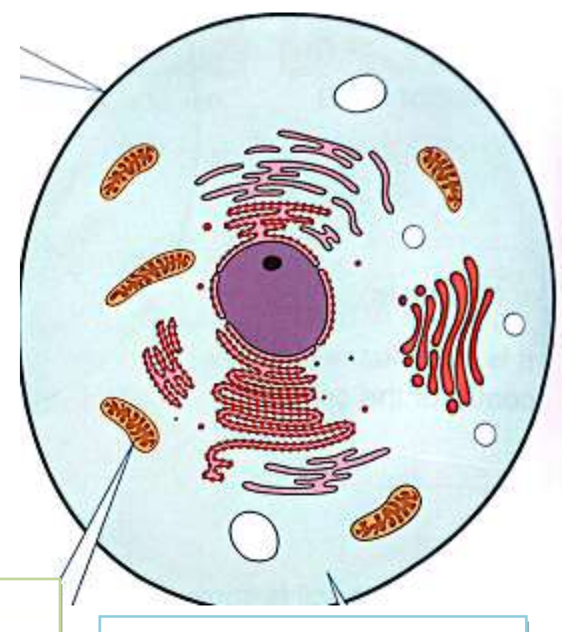
Functions *It protects the cell*
It controls the substances that can enter or leave the cell through the "selective permeability" feature

وظائفه: حماية الخلية يتحكم في المواد التي يمكنها الدخول إلى الخلية أو الخروج منها من خلال خاصية "النفاذية الانتقائية".

Note *Selective permeability feature means that the cell membrane allow some substances to pass through it into the cell, while it prevents some other substances from entering the cell*

ملاحظة: خاصية النفاذية الانتقائية تعني أن غشاء الخلية يسمح لبعض المواد بالمرور من خلاله إلى داخل الخلية، بينما يمنع دخول بعض المواد الأخرى إلى الخلية





Mitochondria الميتوكوندريا

powerhouses" of the cell " محطات القوى " في الخلية
التنفس الخلوي

Function وظيفة

They provide the cell with the energy it needs by converting sugar inside the cell into energy through the "cellular respiration

وهي تزود الخلية بالطاقة التي تحتاجها عن طريق تحويل السكر الموجود داخل الخلية إلى طاقة من خلال "التنفس الخلوي"

Cellular respiration

It is the process that takes place inside the mitochondria, where oxygen is used to obtain the chemical energy stored in food to help the cells make their functions

هي العملية التي تتم داخل الميتوكوندريا، حيث يتم استخدام الأكسجين للحصول على الطاقة الكيميائية المخزنة في الغذاء لمساعدة الخلايا على القيام بوظائفها

Cytoplasm

Function وظيفة

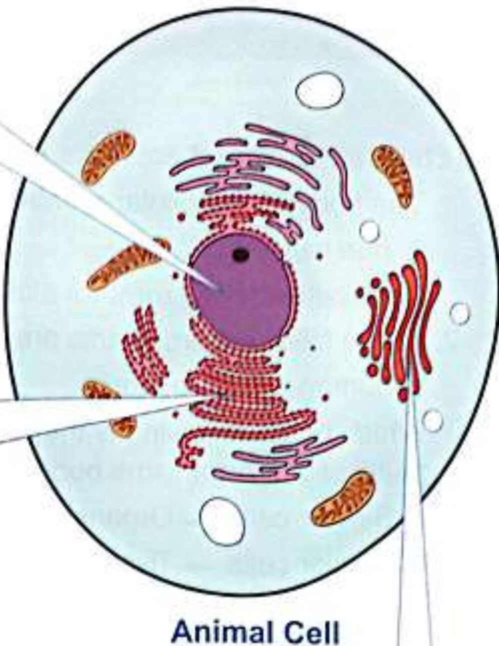
It is the gelatinous liquid (thick liquid) inside the cell in which all other cell parts

وهو السائل الجيلاتيني (السائل السميك) الموجود داخل الخلية والذي توجد فيه جميع أجزاء الخلية الأخرى


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Nucleus Function

-It controls all the cell activities such as
-Formation of proteins-
-Cell division to form new cells
يتحكم في جميع أنشطة الخلية مثل - تكوين البروتينات
انقسام الخلايا لتكوين خلايا جديدة



Endoplasmic reticulum

It is one of the organelles of the cell

Function

It helps in assembling (collecting) and transporting proteins inside the cell to build .and repair the cell
الشبكة الإندوبلازمية هي إحدى عضيات الخلية
وظيفتها تساعد في تجميع (جمع) ونقل البروتينات داخل الخلية لبناء وإصلاح الخلية.

Golgi apparatus *Animal Cell*

Function

It helps in packing and transporting different materials between the cells out of the cell
جهاز جولجي الخلية الحيوانية
وظيفتها يساعد في تعبئة ونقل المواد المختلفة بين الخلايا خارج الخلية

Photosynthesis process: عملية البناء الضوئي:

A process through which green parts of plants (leaves) absorb sunlight to make their own food
عملية تمتص من خلالها الأجزاء الخضراء من النباتات (الأوراق) ضوء الشمس لتصنع غذائها

Photosynthesis process عملية البناء الضوئي

$CO_2 + H_2O + \text{Sunlight} \longrightarrow \text{Sugar starch} + \text{fat} + O_2$

Exercises on Lesson 3

1- Choose the correct answer:

1. This body of unicellular organism consists of

a.one cell only   *b. three cells only*   *c. six cells only*   *d. many cells*

2-All the following organisms are examples of multicellular organisms, except

a. human   *b. home*   *c. bacteria*   *d. apple tree*

3-Which of the following is the correct arrangement of the structure of most of multicellular organisms bodies

a Similar cells   Organs   Tissues   Systems
b Similar cells   Tissues   Organs   Systems
c. Organs   Tissues   Systems   Similar cells.
d. Tissues   Similar   cells Organs   Systems

4-Stomach is composed of a group of different……….

a. bacteria   *b. systems*   *c. organs*   *d. tissues*

5-All the following parts are from the main parts of animal cell, except

a. cell membrane   *b. cytoplasm*   *c. cell wall*   *d. nucleus*

6-The gelatinous liquid which is found inside the cell is known as……….

a. nucleus   *b. cytoplasm*   *c. cell membrane*   *d. organelles*

7-The structure of plant cell which is made up of cellulose is the…………..

a. cell membrane   *b. cell wall*   *c. nucleus*   *d. cytoplasm*

8-Plant cell has the ability to make the photosynthesis process due to the presence of………. inside it

a. mitochondria   *b. chloroplasts*   *c. nucleus*   *d. cytoplasm*

9-The organelles which provide the cell with the needed energy are called………..

a. endoplasmic reticulum   *b. golgi apparatus*
c. mitochondria   *d. cell membrane*

10- Selective permeability of cell membrane means that cell membrane controls…………….

a. the energy which is produced inside the cell
b. the food which is consumed by the cell
c. the substances which are transported inside the cell
d. the substances that can enter or leave the cell

11-All the following are from functions of cell membrane of animal cell, except that

a. it protects the cell   *b. it has the selective permeability feature*
c. it provides the cell with the needed energy
d. it surrounds the cell from outside

12-The two cell organelles which are responsible for transportation process are

a. mitochondria and golgi apparatus b. endoplasmic reticulum and golgi apparatus
c endoplasmic reticulum and mitochondria   d. mitochondria and chloroplasts

13-Nucleus is responsible for controlling

a. formation of proteins only
b. cell division only
c. formation of proteins and cell division
d. formation of proteins and energy production

2-Choose from columns (B) what suits it in column (A)

(A)	(B)
1-Mitochondria	a. All other cell ports float in it
2-Endoplasmic reticulum	b. They provide the call with its needed energy
3-Cytoplasm	c. It helps in packing and transporting different materials between the cells and out of the cell
4-Golgi apparatus	d. It is made up of cellulose
5-Chloroplasts	e. It helps in collecting and transporting proteins inside the cell
	f. It is responsible for making photosynthesis process inside plant cells

_1-……….. 2-………… 3-……….. 4-………… 5- ………..

3-Put (√) or (x)

1-Bacteria and horse are considered as multicellular organisms ( )
2 Respiratory system consists of a group of different organs that do the function of respiration process ( )
3-The human body contains about 40 millions cells ( )
4.Chloroplasts are found in the cells of banana plant leaves. ( )
5. The cells of monkey are surrounded by cell wall from outside ( )
6-Nucleus is found in the center of most cells ( )
7-All cell parts which are found inside the cell are floating in cytoplasm( )
8-Selective permeability feature takes place through the cell wall. ( )
9-Endoplasmic reticulum is collecting and transporting proteins inside the cell to build and repair the cell( )
10-Mitochondria convert sugar inside the cell into the needed energy to make the cell do its vital processes ( )
11. Cellular respiration takes place inside cells by the help of golgi apparatus. ( )

3-Write the scientific term of each of the following

1-They are living organisms that their bodies consist of one cell only (…….………….)
2-They are living organisms that their bodies consist of many cells(….……………..…)
3-It is a gelatinous liquid which is found inside the cell(……………..…)
4. It is the structure which surrounds the animal cell from outside(………………...…)
5. It is often located at the center of the cell (……………..…)
6-They are different tiny structures inside the cell and each type of them has a special function (……………..…)
7-They are cell organelles that provide the cell with the needed energy (……………..…)
8-An organelle which helps in assembling and transporting proteins inside the cell to build and repair the cell (……………..…)
9-An organelle which helps in packing and transporting different materials between the cells and out of the cell (……………..…)

5-Complete the following sentences

1-Human is considered as ……organism, because its body co of many cells
2-Muscle tissue is composed of a group of ……....that do the same function
3-Cells of plants is characterized by the presence of chloroplasts which are responsible for making ……………..process
4-Plant cell similar to animal cell in the presence of cell membrane ……………… , ………..…endoplasmic reticulum and…………….
5-Cellulose makes up…………. which is found in………… cells only
6-Cells of dog is surrounded by……………… from outside
7-Mitochondria in muscle cells convert ……………..inside the cells into……………. which is needed for doing different exercises
8.Transporting proteins inside the cell to build and repair it is the function of ………………while transporting different materials between the cells is the function of………………

6-Give reasons for

1-Cats are considered as multicellular organisms
onthesis process
……………………………………………………………………………
3-Both of endoplasmic reticulum and golgi apparatus are involved in transportation process inside and outside the cell
……………………………………………………………………………

7-What happens if………?

1-There is no chloroplasts inside plant cells
……………………………………………………………………………
2-The cell membrane cannot control the selective permeability feature
……………………………………………………………………………
3-Sugar doesn't reach mitochondria inside a cell
……………………………………………………………………………

8- Look at the following figure, then write the correct number beside the suitable sentence:

1-Powerhouses in the cell (………..)
2-Control the cell division (………..)
3-Assembling and transporting proteins(………)
4-Control the selective permeability feature(………..)
5-Packing and transporting different materials(………..)

Lesson 4

Activity 9 Comparing Plant and Animal Cells

, first let's see some parts that are found in the plant call only and :characterize it, which are

Cell wall

It is made up of cellulose
It is a rigid (hard) external material that surrounds the cell membrane of plant cell

Function

It surrounds the plant cell to give it a definite shape

جدار الخلية يتكون من السليلوز
-وهو مادة خارجية صلبة (صلبة) تحيط بالغشاء الخلوي للخلية النباتية
الوظيفة
تحيط بالخلية النباتية لتعطيها شكلاً محدداً

Chloroplasts-

They are sac-like organelles that contain .tiny green granules
These granules have green color because they contain a green pigment called chlorophyll

Function

They have chlorophyll that absorbs the energy of the sunlight for the plant to make its own food through the photosynthesis process

- البلاستيدات الخضراء هي عضيات تشبه الأكياس تحتوي على حبيبات خضراء صغيرة. هذه الحبيبات ذات لون أخضر لأنها تحتوي على صبغة خضراء تسمى الكلوروفيل.
وظيفتها أنها تحتوي على الكلوروفيل الذي يمتص طاقة ضوء الشمس ليتمكن النبات من صنع طعامه. من خلال عملية البناء الضوئي..

Sap vacuole

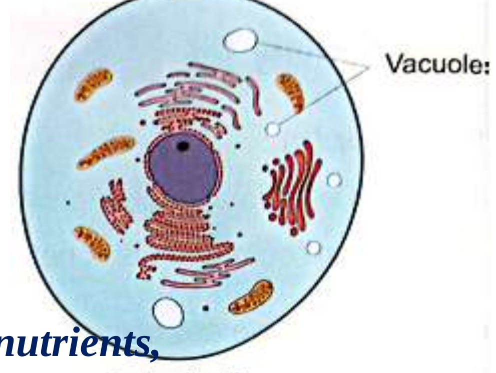
- It is a large sac-like organelle
- The plant cell has only one special big vacuole called "sap vacuole

Function

It stores nutrients, water and waste materials .inside the plant cell

فجوة عصارية
- وهي عبارة عن عضية كبيرة تشبه الكيس
- تحتوي الخلية النباتية على فجوة كبيرة خاصة واحدة فقط تسمى فجوة عصارية
الوظيفة
تقوم بتخزين العناصر الغذائية والمياه ومواد النفايات داخل الخلية النباتية

Plant cell



Animal cell

1-Vacuoles in the animal cell

The animal cell has many and small vacuoles-

الفجوات في الخلية الحيوانية-تحتوي الخلية الحيوانية على فجوات كثيرة وصغيرة

Function of vacuoles in animal cell: -They store nutrients, water and waste materials inside the animal cell

-وظيفة الفجوات في الخلية الحيوانية: -تقوم بتخزين المواد الغذائية والمياه والفضلات داخل الخلية الحيوانية


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2-The animal cell doesn't have a cell wall, *so it doesn't have a definite shape as the plant cell*

2-الخلية الحيوانية ليس لها جدار خلوي، لذا ليس لها شكل محدد كالخلية النباتية.

3-Animals have other structures to keep their shapes such as

Some animals have bones such as cats, dogs, birds... etc. - Some animals - have a hard shell-like cover called "exoskeleton" that gives them their shapes such as some insects

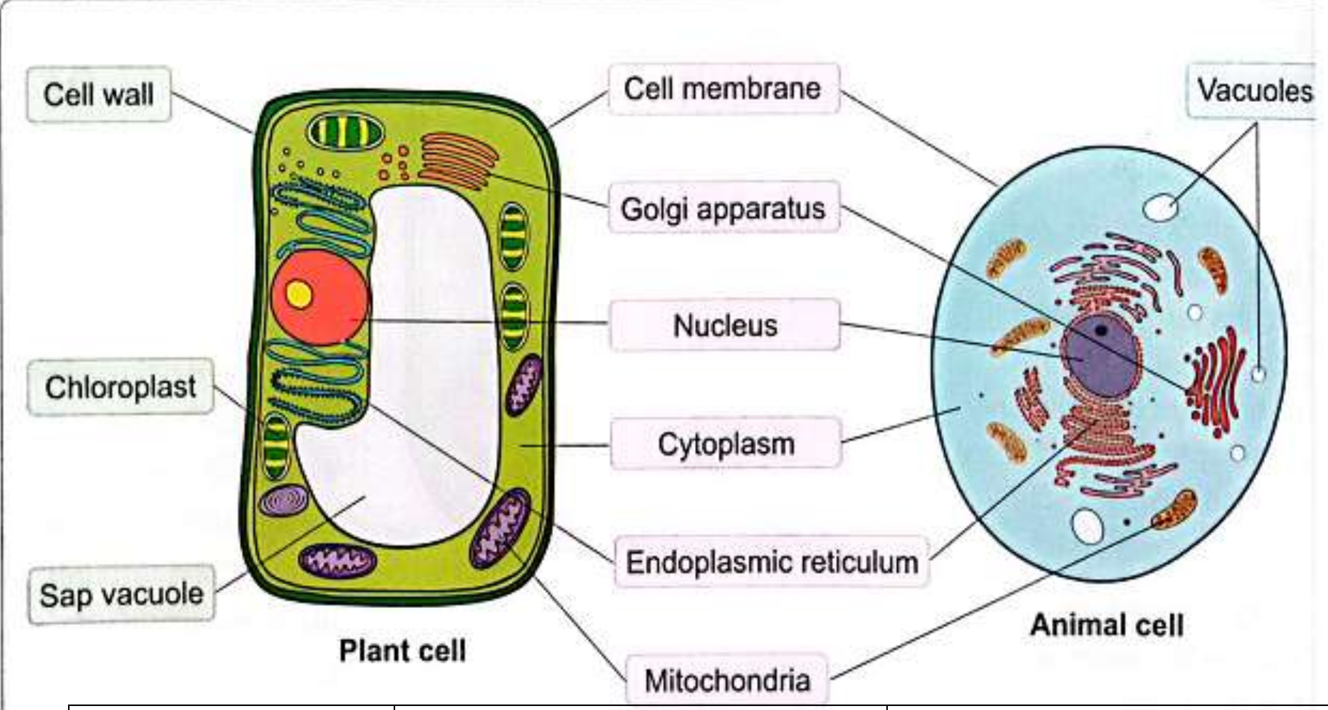
3-للحيوانات هياكل أخرى تحافظ على أشكالها مثل

-بعض الحيوانات لها عظام مثل القطط والكلاب والطيور...إلخ - بعض الحيوانات لها غلاف صلب يشبه الصدفة يسمى الهيكل الخارجي يعطيها شكلها مثل الحشرات

Comparing plant and animal cells مقارنة الخلايا النباتية والحيوانية

The following figures and the table in the next page show a comparison between the plant cell and the animal cell

الأشكال التالية والجدول في الصفحة التالية يوضح المقارنة بين الخلية النباتية والخلية الحيوانية



Points of comparison	Plant cell	Animal cell
Definition	It is the main building unit of plant's body	It is the main building unit of animal's body
Cell membrane	Present	Present
Cytoplasm	Present	Present
Nucleus	Present	Present
Mitochondria	Present	Present
Golgi apparatus	Present	Present
Endoplasmic reticulum	Present	Present
Vacuole	One big sap vacuole	Many small vacuoles
Chloroplasts	Present	Absent
Cell wall	Present	Absent

Note ملاحظة

Cell organelles include mitochondria, golgi apparatus, endoplasmic reticulum, vacuoles and chloroplasts

تشمل عضيات الخلية الميتوكوندريا وجهاز جولجي والشبكة الإندوبلازمية والفجوات والبلاستيدات الخضراء

Give reason for أعط سببًا لـ

1-Animals cannot make their own food لا تستطيع الحيوانات صنع طعامها-

Because bodies of animals are made up of animal cells which don't have chloroplasts

لأن أجسام الحيوانات تتكون من خلايا حيوانية لا تحتوي على البلاستيدات الخضراء

2-The animal cell doesn't have a definite shape.

الخلية الحيوانية ليس لها شكل محدد

.Because the animal cell doesn't have a cell wall

.لأن الخلية الحيوانية لا تحتوي على جدار خلوي

Activity 10 Planning A Cell City

The cell as a system looks like a city that has different buildings and - structures to carry out the needed functions of the city

- تبدو الخلية كنظام كمدينة تحتوي على مباني وهياكل مختلفة لتنفيذ الوظائف المطلوبة للمدينة

In this activity, you are going to design a city structures that could - .represent some different parts of the cell

-في هذا النشاط، ستقوم بتصميم هياكل مدينة يمكن أن تمثل بعض الأجزاء المختلفة من الخلية.

You can use different materials to build up your "cell city" model such - .as: clay, cardboard sheets, crayons, blocks, wooden sticks...etc

- يمكنك استخدام مواد مختلفة لبناء نموذج &;المدينة الخلوية&; الخاص بك مثل: الطين، وأوراق الكرتون، وأقلام التلوين، والمكعبات، والعصي الخشبية...إلخ.

Use the following table that helps you build up your model ►

Cell structures تركيب الخلية	**City structures** تركيب المدينة
Nucleus نواة	*City hall* قاعة المدينة
Cell membrane غشاء الخلية	*Guards at city gates* الحراس عند بوابات المدينة
Mitochondria الميتوكوندريا	*Electrical power station* محطة الطاقة الكهربائية
Endoplasmic reticulum الشبكة الإندوبلازمية	*Construction workers* عمال البناء
Golgi apparatus جهاز جولجي	*Post office* مكتب البريد
Vacuole فجوة	*Storehouse* المخزن
Cell wall (plants only) جدار الخلية (النباتات فقط)	جدار *A stone wall surrounding the city* حجري يحيط بالمدينة
Chloroplast (plants only) البلاستيدات الخضراء (النباتات فقط)	*Food factory* مصنع أغذية





Activity 11 Build A Cell City النشاط 11 بناء مدينة خلوية

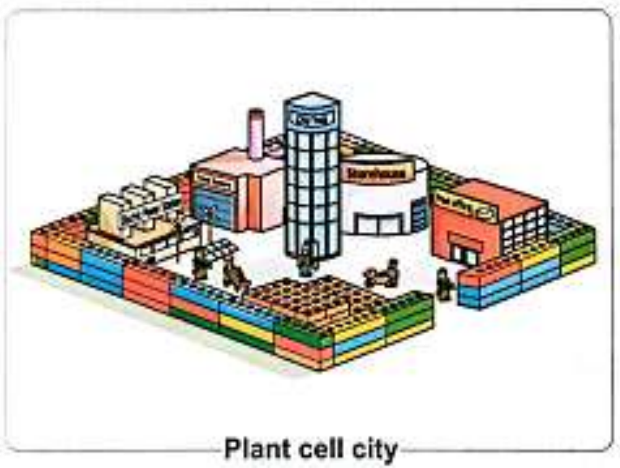
In this activity, you will use your plan for building a cell city that you have developed in the previous activity to create a visual model of a plant cell and another model of an animal cell

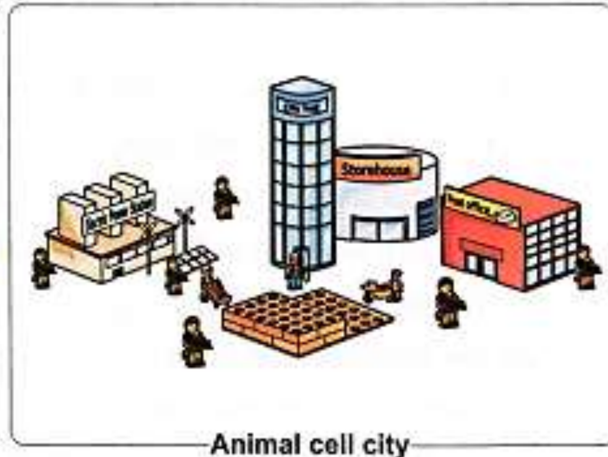
في هذا النشاط، ستستخدم خطتك لبناء مدينة خلوية قمت بتطويرها في النشاط السابق لإنشاء نموذج مرئي لخلية نباتية ونموذج آخر لخلية حيوانية

What will you do? ما الذي سيحدث ماذا تفعل؟

1-Review your plan for building a cell city that you create in the previous activity
2-Prepare your materials to build your models.
3. Build a model for the plant cell and another one for the animal cell and label the structures of each model
4-Compare between the two models

1- راجع خطتك لبناء المدينة الخلوية التي قمت بإنشائها في النشاط السابق-2 قم بإعداد المواد الخاصة بك لبناء نماذجك.
.3 قم ببناء نموذج للخلية النباتية وآخر للخلية الحيوانية وقم بتسمية تركيب كل نموذج4-قارن بين النموذجين


Plant cell city


Animal cell city

Note ملحوظة

There are two structures in plant cell that are not found in the animal cell, which are

يوجد في الخلية النباتية تركيبان غير موجودين في الخلية الحيوانية وهما

الجدار الحجري*1-The stone wall surrounding the city (that represents the cell wall)* المحيط بالمدينة (الذي يمثل جدار الخلية)

2-The food factory (that represents the chloroplast)
2-مصنع الأغذية (الذي يمثل البلاستيدات الخضراء)

Exercises on Lesson 4 and 5

1- Choose the correct answer:

1- Cellulose forms ……………of plant cell

a. cell membrane   b. cell wall   c. chloroplasts   d. sap vacuole

2-The function of cell wall is……………..

a. surrounding animal cell to give it a definite shape

b. storing nutrients, water and waste materials inside the cell.

c. surrounding plant cell to give it a definite shape

d. making food of plants by photosynthesis process.

3. All the following structures are found in onion cells only and not found in fish cell except…………

a. cell wall   b. one sap vacuole   c. chloroplasts   d. mitochondria

4. All the following are from characters of chloroplasts, except that…………

a. they are sac-like organelles   b. they contain tiny green granules

c. they are found in both plant and animal cells.

d. they contain chlorophyll pigment

5-All the following can be stored inside sap vacuole of plant cell, except

a. energy   b. nutrients   c. water   d. waste material

6-The animal cell doesn't have a definite shape, because it doesn't have a…….

a. cell membrane   b. cell wall   c. chloroplast   d. nucleus

7-All the following animals have bones in there bodies, except

a. cats   b. dogs   c. birds   d. insects

8-The animal cell cannot make photosynthesis process, because it doesn't have……

a. nucleus   b. chloroplasts   c. mitochondria   d. sap vacuole

9-The structure which is found in the cell of a banana tree leaf and not found in the cell of a cat is…….

a. nucleus   b. golgi apparatus   c. cell membrane   d. cell wall

10-Most plants appears in ………color due to the presence of chlorophyll pigment in their cells

a. yellow   b. blue   c. green   d. red

2-Choose from column (B) what suits it in column (A)

(A)	(B)
1-Cell wall	a. stores nutrients, water and waste materials inside the plant cell
2. Chloroplasts	b. surrounds the plant cell to give it a definite shape. e
3.Sap vacuole	c. gives the animal cell its definite shape
4.Chlorophyll	d. are sac-like organelles that contain tiny green granules.
	e. absorbs the energy of sunlight to make photosynthesis process

1-…………..   2-……………   3-…………..   4-……………

3-Put (√) or (x)

1- Cell wall surrounds the cell membrane of animal cells ( )

2- There is one big vacuole in the cell of onion plant ( )

3-Chlorophyll is responsible for absorbing the energy of sunlight to make the food of plants ( )



4-The green color of plants is due to the presence of vacuoles in their cells ( )
5-Their are many small vacuoles in the cells of a bird ( )
6-Exoskeleton gives some insects their shapes. ( )
7. Cells of human don't have definite shape due to the absence of cell membrane ( )
8-The horse can make its own food due to the presence of chloroplasts in its cells ( )

4-Write the scientific term of each of the following

1- It surrounds the plant cell to give it a definite shape (…………….)
2. A one big sac-like organelle in the plant cell that stores nutrients, water and waste materials (…………….)
3-They are sac-like organelles that contain tiny green granules and found in plant cells only (…………….)
4. It is a green pigment which absorbs the energy of sunlight to make photosynthesis process in plants (…………….)

5-Give reasons for

1-Plant cell has a definite shape
…………………………………………………………………………
2- Chlorophyll absorbs the energy of the sunlight
…………………………………………………………………………
3-Mitochondria act as electrical power stations in cities
…………………………………………………………………………
4-Vacuoles act as storehouse in cities
…………………………………………………………………………

6-What happens if

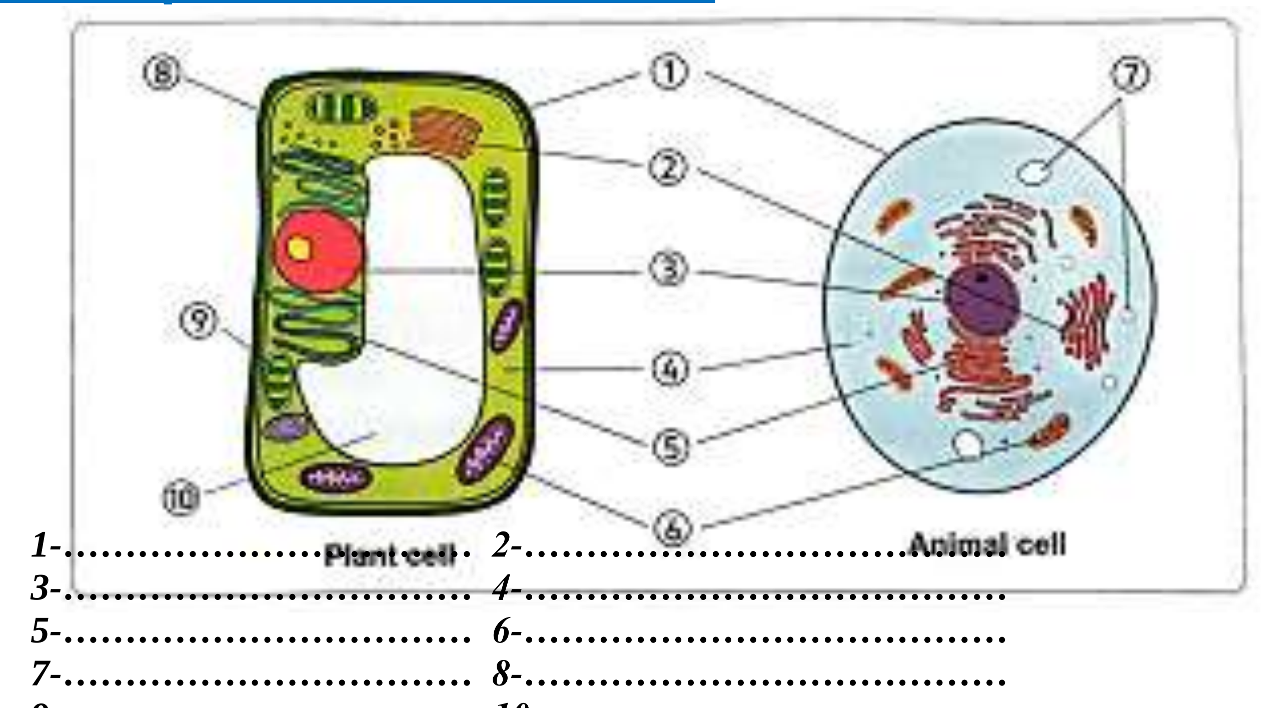
1-The animal cell is surrounded by cell wall
…………………………………………………………………………
2-There is no chloroplasts in plant cells
…………………………………………………………………………
3-There is no bones found in the body of the cat
…………………………………………………………………………

7-Look at the opposite figure, then complete the following sentences

1-Structures number ……..…..and ………..are found in plant cell only
2-Structures number and……..…..,………..,………,……… ….. and ………..are found in both plant cell and animal cell
3-Structure number …………acts like the city hall in cities
4-Structure number the food factory of plant cell is considered as


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8-Label the following figures that show the differences between plant cell and animal cell



1-…………………………… 2-…………………………………
3-…………………………… 4-…………………………………
5-…………………………… 6-…………………………………
7-…………………………… 8-…………………………………
9-…………………………… 10-…………………………………

Lesson 6

Activity 12 Record Evidence Like a Scientist

My Scientific Explanation شرحي العلمي

The cell is the main building unit of any living organism.
Each of the cell components and its organelles has a specific function, where

الخلية هي وحدة البناء الرئيسية لأي كائن حي. لكل مكون من مكونات الخلية وعضياتها وظيفة محددة، حيث

-**The cell membrane** *protects the cell and contains its components*
-غشاء الخلية يحمي الخلية ويحتوي على مكوناتها

-**Cytoplasm** *is a thick liquid where all the cell components float*
السيتوبلازم سائل سميك تطفو فيه جميع مكونات الخلية

--**The nucleus** *controls all the cell activities*
- النواة تتحكم في كل الخلية الأنشطة

.**Mitochondria** *supplies the cell with the needed energy*-
- تقوم الميتوكوندريا بتزويد الخلية بالطاقة اللازمة.

Note ملاحظة

Your scientific explanation should explain your claim and evidence introducing some supportive examples from what you have learned
يجب أن يوضح تفسيرك العلمي ادعاءك والأدلة التي تقدم بعض الأمثلة الداعمة مما تعلمته.

Activity 13 STEM Careers and Cell Biology المهن وبيولوجيا الخلية

Cell biologists *are scientists who study cells*
علماء بيولوجيا الخلية علماء يدرسون الخلايا



Cells *are very tiny, where the diameter of an animal cell is about (0.001 cm)*
الخلايا صغيرة جدًا، حيث يبلغ قطر الخلية الحيوانية حوالي (0.001 سم)

Cell biologists use microscopes *to magnify cells so they seem larger*
علماء بيولوجيا الخلية يستخدمون المجاهر لتكبير الخلايا بحيث تبدو أكبر

Cell biologists work in laboratories *and do experiments to study*
يعمل علماء بيولوجيا الخلية في المختبرات وإجراء تجارب للدراسة

-How cells work inside the living organisms - كيف تعمل الخلايا داخل الكائنات الحية
- How cells respond to different variables كيف تستجيب الخلايا للمتغيرات المختلفة

Cell biologists analyze data *and present their conclusions to other researchers, where* •
•يقوم علماء الأحياء الخلوية بتحليل البيانات وتقديم استنتاجاتهم إلى باحثين آخرين، حيث

-**Some cell biologists work with doctors** *to watch how cells can work to repair body parts or how cells respond to different medicines*
- يعمل بعض علماء الأحياء الخلوية مع الأطباء لمراقبة كيفية عمل الخلايا لإصلاح أجزاء الجسم أو كيفية استجابة الخلايا للأدوية المختلفة

-**Some other cell biologists work in agriculture** *to study how plant cells respond to different environmental factors* -

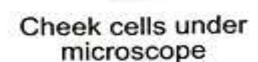
يعمل بعض علماء الأحياء الخلويين الآخرين في الزراعة لدراسة كيفية استجابة الخلايا النباتية للعوامل البيئية المختلفة

Staining Cells صباغة الخلايا

-**Cells are usually clear and colorless**, *so it is hard to see their structures under microscope*

الخلايا عادة ما تكون شفافة وعديمة اللون، لذلك يصعب رؤية بنيتها تحت المجهر -.

Nucleus



Cheek cells under microscope

-**Stains** *(dyes) are used to* **add color** *and make the cell's structures* **more visible**

-تستخدم البقع (الأصباغ) لإضافة اللون وجعل بنيات الخلية أكثر وضوحا.

-There are different types of stains, *where some stains are used to highlight one part of cells and make it more visible such as "methylene blue dye that helps you see the nucleus as a blue area in a sample of cheek lined membrane cells*

-هناك أنواع مختلفة من البقع، حيث توجد بعض البقع تستخدم لتسليط الضوء على جزء واحد من الخلايا وجعله أكثر وضوحا مثل;صبغة الميثيلين الزرقاء التي تساعدك على رؤية النواة كمنطقة زرقاء في عينة من الخلايا الغشائية المبطنة بالخد.

Cells in 3D الخلايا ثلاثية الأبعاد

Scientists have built a microscope *that shows the cell in 3D, which means that they can see the top, sides and layers of a cell, where*

قام العلماء ببناء مجهر الذي يُظهر الخلية بشكل ثلاثي الأبعاد، مما يعني أنه يمكنهم رؤية الجزء العلوي والجوانب وطبقات الخلية، حيث

The 3D microscope *takes pictures of a cell in layers*

يلتقط المجهر ثلاثي الأبعاد صورًا للخلية في طبقات

Then, a computer puts these layers together. -

-**Finally**, *colors are added to the formed image*

- ثم يقوم الكمبيوتر بتجميع هذه الطبقات معًا. -وأخيرا، يتم إضافة الألوان إلى الشكل

The 3D microscope can help

Cell biologists learn more about cell components and how cells divide.

.Doctors to treat cancer which is caused by cells that divide too quickly

المجهر ثلاثي يمكن أن يساعد الأبعاد علماء الأحياء الخلوية في معرفة المزيد عن مكونات الخلية وكيفية انقسام الخلايا. الأطباء يعالجون السرطان الذي يسببه الخلايا التي تنقسم بسرعة كبيرة.

Exercises on Lesson 6

1- Choose the correct answer:

1- Cell biologists use microscopes to magnify………….to appear larger

a. stones b. bricks c. cells d. rocks

2-Cell biologists do experiments and analyze data to study all the following except .

a. how cells respond to different medicines
b. how rocks are formed on Earth's surface
c. how cells can work to repair body parts.
d. how plant cells respond to different environmental factors

3-To see the structure of a cell under microscope we must color it by using……

a. stains b. water c. sunlight d. vinegar

4-Methylene blue dye helps us to see the …….of the cell as a blue area under microscope

a. cytoplasm b. golgi apparatus c. chloroplasts d. nucleus

5-The 3D microscope can help in all the following, except that it helps

a. cell biologists learning more about cell components
.b. scientists to know how planets revolve around the Sun
c. doctors to treat some diseases as cancer
d. cell biologists learning more about how cells divide

2-Put (√) or (x)

2-Cell 1-Cells are very large, as the diameter of an animal cell is about 0.001 cm ( ) ( )
biologists are scientists who study rocks
3-Cell biologists work in laboratories and do experiments to study how cells work inside living organisms ( )
4-Cells are usually clear and colorless, so it is easy to see their structures under microscope ( )
5-The 3D microscope can help doctors to treat cancer disease ( )

3-Write the scientific term of each of the following

1-They are scientists who study cells (…………….……..)
2- A stain that is used to color the nucleus of the bell in blue color(………………..)
The microscope that helps us to see the top, sides and layers of the cell(……………..)

4 -Complete the following sentences using the words below:

(methylene blue - microscope - agriculture - cell biologists - doctors)
1-Cell biologists use……….. to magnify cells of bacteria
2-Cell biologists work in ……….. to study plant cells and their respond to different environmental factors.
3-Cell biologists work with………. to watch how cells can work to repair the human body parts
4-To see the nucleus of a cell under microscope, we can stain the cell with……….
5- The 3D microscope can help ………..learn more about how cells divide

5-Give reasons for

1-Some cell biologists work with doctors

……………………………………………………………………………

2-We must stain cells before examining them under microscope

……………………………………………………………………………

6-What happens if

We stain a sample of cheek cells with methylene blue dye

……………………………………………………………………………



Concept 2

The body as a System

Lesson 1

Activity 1	*Explain to your child how does her body function as a system*
Activity 2	*Discuss with your child the interactions between systems are Important in dangerous situations*
Activity 3	*Explain to your child how do the nervous system, circulatory system and digestive system depend on each other to do their functions*

Lesson 2

Activity 4	*Explain to your child how are cells organized to build the human body*
Activity 5	*Discuss with your child how her arm moves due to contraction and relaxation of muscles connected to the bones of the arm*

Lesson 3

Activity 6	*Discuss with your child the difference between involuntary muscles and voluntary muscles*
Activity 7	*Explain to your child how do the endocrine system, circulatory system and respiratory system work together to help the body gets ready to fight a danger or to run away from it*

Lesson 4

Activity 8	*Discuss with your child how the digestion process occurs in his/her body*
Activity 9	*Explain to your child how his body gets rid of waste materials.*

Lesson 5

Activity 10	*Explain to your child how the kidneys work as a filtering system for the blood*
Activity 11	*Let your child answer the questions to check his/her understanding*

Lesson 6

Activity 12	*Help your child to think like a scientist by answering a question about one of the main points of this concept then write his/her claim, evidence and the scientific explanation*


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Lesson 1

Activity 1 Can You Explain

When you fool nervous, your heartbeats increase, your body starts to sweat and you may feel pain in your stomach
عندما تخدعك الأعصاب، تزداد نبضات قلبك، ويبدأ جسمك بالتعرق وقد تشعر بألم في معدتك

In your body, all systems work together as one whole body system
في جسمك، تعمل جميع الأجهزة معًا كجهاز واحد كامل للجسم

How does your body function as a system
كيف يعمل جسمك كنظام

Different systems in your body perform different functions, where all - systems Interact and work together in an integrated way
- تؤدي الأجهزة المختلفة في جسمك وظائف مختلفة، حيث تتفاعل جميع الأجهزة وتعمل معًا بطريقة متكاملة

Examples أمثلة

The interaction between the nervous system and the circulatory system, where
التفاعل بين الجهاز العصبي والجهاز الدوري، حيث

when you feel nervous, your heartbeats increase
عندما تشعر بالتوتر تزداد نبضات قلبك

The interaction between the digestive system and the skeletal system, where the digestive system provides the skeletal system with nutrients needed for growth and fracture healing
التفاعل بين الجهاز الهضمي والجهاز الهيكلي، حيث يقوم الجهاز الهضمي بتزويد الجهاز الهيكلي بالعناصر الغذائية اللازمة للنمو وشفاء الكسور

In this concept, we will study في هذا المفهوم سندرس

Danger response الاستجابة للخطر *Endocrine system* جهاز الغدد الصماء

Respiratory system الجهاز التنفسي *Excretory system* الجهاز الإخراجي

Circulatory system الدورة الدموية

Digestive system الجهاز الهضمي

Building living systems بناء الأجهزة الحية

Activity 2 Danger Response استجابة الخطر

How do your body systems work together in dangerous situations
كيف تعمل أجهزة جسمك معًا في المواقف الخطرة

The opposite picture shows a cyclist in a dangerous situation
الصورة المقابلة تظهر راكب دراجة في موقف خطير

The body **systems** *of the cyclist work together to* **produce physical responses** *such as an* **increase in the heartbeats** **to face this dangerous situation, where**

تعمل أجهزة جسم راكب الدراجة معًا لإنتاج استجابات جسدية مثل زيادة نبضات القلب لمواجهة هذا الخطر الموقف، حيث:

*When the **eyes** of the cyclist **see a dangerous situation,** the brain **receives the information** from the **eyes***

عندما ترى عيون راكب الدراجة موقفا خطيرا، يستقبل الدماغ المعلومات من العينين

*Then, the **brain sends a signal to the muscles** that contract and allow his body to face the danger*

ثم يرسل الدماغ إشارة إلى العضلات التي تنقبض وتسمح لجسمه بمواجهة الخطر

*So, the **interactions** between body **systems** (**circulatory** system and **muscular** .system) are **important in dangerous** situations*

لذا فإن التفاعلات بين أجهزة الجسم (الدورة الدموية والجهاز العضلي) مهمة في المواقف الخطرة.

Activity 3

What Do You Already Know About the Body as a System

ماذا تعرف بالفعل عن الجسم كنظام

all systems interact and work together in an integrated way

جميع الأجهزة تتفاعل وتعمل معًا بطريقة متكاملة

***How do the nervous system circulatory system and digestive system** depend on each other to do their functions*

كيف يعتمد الجهاز العصبي والجهاز الدوري والجهاز الهضمي على بعضهما البعض في القيام بوظائفهما

Example مثال

***The nerve cells** in the nervous system need nutrients to perform their .functions, these nutrients reach the body as food*

تحتاج الخلايا العصبية في الجهاز العصبي إلى عناصر غذائية لتؤدي وظائفها، وتصل هذه العناصر الغذائية إلى الجسم كغذاء

*After the **digestive system digests** this **food**, nutrients are **transmitted** to the nerve cells **through the blood** in the circulatory system*

بعد أن يهضم الجهاز الهضمي هذا الطعام، تنتقل العناصر الغذائية إلى الخلايا العصبية عبر الدم في الدورة الدموية.

*The **nervous system** **depends on** the **digestive system** and **circulatory system**) to do its function)*

***The nervous system** controls the **muscles of stomach** in the digestive system and the muscles of heart in the circulatory system.*

يتحكم الجهاز العصبي في عضلات المعدة في الجهاز الهضمي وعضلات القلب في الدورة الدموية

*This **means** that the **digestive system** and **circulatory system** depend on the **nervous system** to do their functions)*

(وهذا يعني أن الجهاز الهضمي والدورة الدموية يعتمدان على الجهاز العصبي للقيام بوظائفهما) .

Exercises on Lesson 1

1- Choose the correct answer:

1- When you feel nervous, your heartbeats increase, this indicates the Interaction between ……….systems

a. digestive and nervous *b. digestive and circulatory*
c. nervous and circulatory *digestive and respiratory*

2-Skeletal system takes nutrients from………….. system for growth of muscles

a. circulatory *b. digestive* *c. nervous* *d. respiratory*

3-When you touch a hot cup of tea, ………………system sends a message to the muscles of your hand to contract

a. respiratory *b. digestive* *c. circulatory* *d. nervous*

4. In a dangerous situation, your eyes send the information to the…………. to perform the suitable action

a. brain *b. stomach* *c. lungs* *d. heart*

5-Muscles of stomach and muscles of heart can be controlled by……… system

a. digestive *b. circulatory* *c. nervous* *d. respiratory*

6-The nerve cells depend on……….. systems to get their needed nutrients

a. digestive and respiratory *b. digestive and circulatory*
c. circulatory and respiratory *d. circulatory and nervous*

7-The system which transfers nutrients from the digestive system to the different muscles of the body is the…………. system

a. circulatory *b. nervous* *c. respiratory* *d. excretory*

8-In dangerous situations……………..

a. all systems of the body interact together
b. circulatory system interacts with digestive system only
c. nervous system sends message to digest food in stomach.
d. respiratory system interacts with circulatory system only

2-Put (√) or (x)

1- All systems in your body work together in an integrated way ( )
2-When you hear a clock alarm, your brain sends a signal to the muscles to move and wake up ( )
3-In dangerous situations, nervous system only allows your body to face the danger ( )
4. Digestive system can digest food without the help of nervous system ( )
5-Muscles of heart are controlled by nervous system ( )
6-Nutrients reach the nerve cells which found in your hand by the help of circulatory system ( )
7-Digestive system transfers oxygen gas to all muscles in your body ( )

3-Complete the following sentences using the words below:

(body systems-blood-nervous- nutrients-muscles - brain)

1-When you feel nervous, there is an interaction between circulatory system and …………..system
2. When you touch a sharp thorn, your hand moves away quickly due to the interaction between nervous system and………… in your hand

3. When you smell a fire smoke, the …………….sends a message to your leg muscles to walk toward the fire location
4. The interaction between ………is important in any dangerous situation
5-Digestive system provides the nerve cells with……………. which are needed to perform their functions
8-Nutrients are transmitted from digestive system to nervous system through the………………. in the circulatory system

4-Give reasons for

1- Digestive system helps skeletal system in fracture healing

……………………………………………………………………

2- The nerve cells in the nervous system need nutrients

……………………………………………………………………

The importance of nervous system for the muscles of heart

……………………………………………………………………

5-What happens to

The brain of a cyclist when he sees a dangerous situation

……………………………………………………………………

6-Use the following systems to complete the table below

(you can use the same system more than once)

(Digestive system - Circulatory system - Nervous system)

Description	Name of system
1-It controls the muscles of stomach	…………………..
2-It transmits nutrients from digestive system to the nerve cells	…………………..
3-It provides the muscles of heart with its needed food	…………………..
4-It controls the muscles of heart	…………………..
5- They help in providing and transmitting the nutrients to the muscles of arms	…………………..



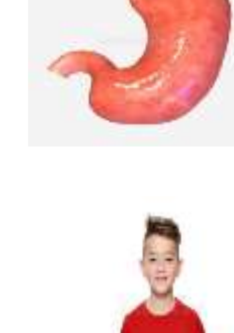
Lesson 2

Activity 4 Building Living Systems

the human body is a multicellular organism that consists of
جسم الإنسان هو كائن متعدد الخلايا يتكون من

.Different shapes of **animal cells**
أشكال مختلفة من الخلايا الحيوانية

.A **group** *of similar* **cells** *form a* **tissue**
مجموعة من الخلايا المماثلة تشكل الأنسجة



.A **group** *of different* **tissues** *form an* **organ**
مجموعة من الأنسجة المختلفة تشكل عضوًا



A **group** *of different* **organs** *form a* **system**
مجموعة من الأعضاء المختلفة تشكل جهاز



.A **group** *of different* **systems** *form the whole* **body**
مجموعة من الاجهزة المختلفة تشكل الجسم كله

How are cells organized to build the human body

كيف يتم تنظيم الخلايا لبناء جسم الإنسان؟

From cells to tissues من الخلايا إلى الأنسجة

Although all cells have things in common but there are many shapes and sizes of cells, because cells must be specialized to perform specific function
على الرغم من أن جميع الخلايا لديها أشياء مشتركة إلا أن هناك العديد من أشكال وأحجام الخلايا، لأن الخلايا يجب أن تكون متخصصة لأداء وظيفة محددة

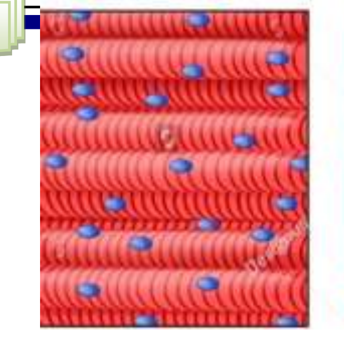
Example: Muscle cells مثال: خلايا العضلات



They are in the form **of long fibers** *to* **allow movement**
و هي على شكل ألياف طويلة للسماح بالحركة

They must be **able to store and use energy** *quickly.*

They do **not work alone**, *because the size of the muscle cell is very small and must work with thousands of other cells to be effective. They are bundled (collected) together to form tissues*
وهي لا تعمل بمفردها، لأن حجم الخلية العضلية صغير جدًا ويجب أن تعمل مع آلاف الخلايا الأخرى لتكون فعالة. يتم تجميعها (جمعها) معًا لتكوين الأنسجة




From tissues to organs من الأنسجة إلى الأعضاء

Bundles of tissues are organized to form the muscle.
The muscle is considered an organ
يتم تنظيم حزم الأنسجة لتكوين العضلات. تعتبر العضلة عضوًا :

An organ *is a part of an organism that has a* **specific function**
العضو هو جزء من كائن حي له وظيفة محددة

Example: *The muscle that lies on the front part of upper arm between the elbow and the shoulder*
مثال: العضلة التي تقع في الجزء الأمامي من أعلى الذراع بين المرفق والكتف.

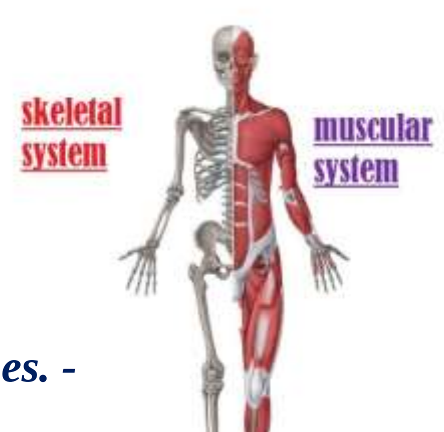
From organs to systems من الأعضاء إلى الأجهزة

There are many organs in the body .
هناك العديد من الأعضاء في الجسم.

Each system is a group of organs that perform a specific function for the body
كل جهاز عبارة عن مجموعة من الأعضاء التي تؤدي وظيفة محددة للجسم

Example *Musculoskeletal system* الجهاز العضلي الهيكلي

The musculoskeletal system *is formed of* **two** *systems which are* **muscular system** *and* **skeletal system** *that work together to allow the body movement*
يتكون الجهاز العضلي الهيكلي من جهازين وهما عضليان جهاز وجهاز هيكلي يعملان معًا للسماح بحركة الجسم





It consists of a group of organs which are-Bones. - Muscles - Ligaments Tendons. – Cartilages-
يتكون من مجموعة من الأعضاء وهي - العضلات- الأربطة. - العظام. - الأوتار. - الغضاريف.

Each of these organs has a specific role to allow the musculoskeletal system to do its function
• لكل عضو من هذه الأعضاء دور محدد للسماح للجهاز العضلي الهيكلي بالقيام بوظيفته.

From systems to the whole body من الأجهزة إلى الجسم بأكمله

Many of the simple tasks you perform daily require different systems to work together العديد من المهام البسيطة التي تؤديها يوميًا تتطلب أنظمة مختلفة للعمل معًا

Example *When you play football, this requires interaction between the respiratory system, circulatory system, nervous system, musculoskeletal system and excretory system.*
مثال عندما تلعب كرة القدم، يتطلب ذلك التفاعل بين الجهاز التنفسي والجهاز الدوري والجهاز العصبي والجهاز العضلي الهيكلي والجهاز الإخراجي.

Activity 5 Moving Muscles

All systems interact and work together as one whole system

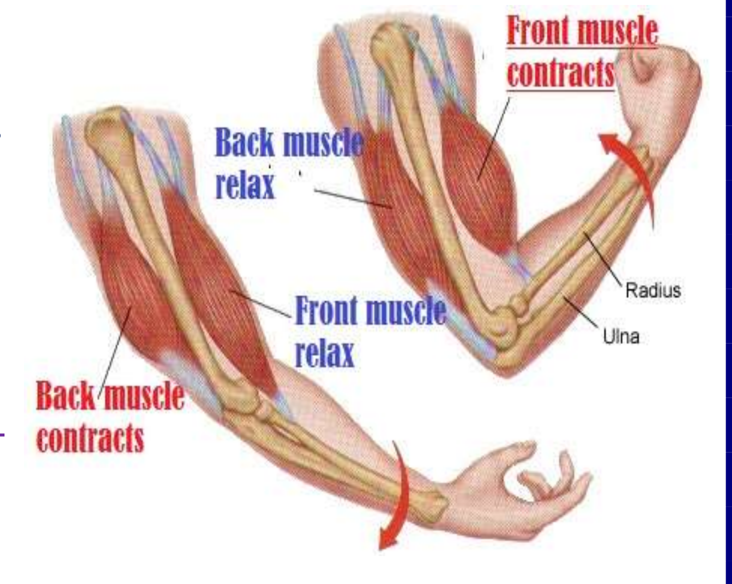
تتفاعل جميع الأجهزة وتعمل معًا كنظام واحد كامل

We will study an **example of systems** *which are the* **skeletal** *system and* **muscular** *system that work together to allow the* **movement of your arm towards your shoulder**

سندرس مثالاً على الأجهزة وهي الجهاز الهيكلي والجهاز العضلي اللذان يعملان معًا للسماح بحركة ذراعك نحو كتفك

Your arm moves due to **contraction** *and* **relaxation** *of muscles connected to the bones of the arm, where*

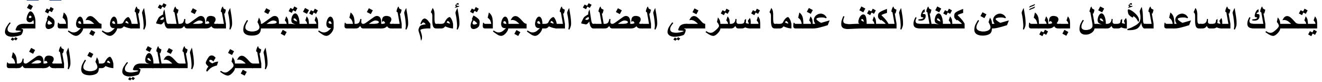
تتحرك ذراعك بسبب الانقباض والاسترخاء من العضلات المتصلة بعظام الذراع، حيث



The forearm moves up towards your shoulder *when the muscle in front of the upper arm contracts and the muscle in the back of the upper arm relaxes*

يتحرك الساعد للأعلى نحو كتفك عندما تنقبض العضلة الموجودة أمام الجزء العلوي من الذراع وتسترخي العضلة الموجودة في الجزء الخلفي من الذراع

The forearm moves down away from your shoulder *when the muscle in front of the upper arm relaxes and the muscle in the back of the upper arm contracts*


يتحرك الساعد للأسفل بعيدًا عن كتفك الكتف عندما تسترخي العضلة الموجودة أمام العضد وتنقبض العضلة الموجودة في الجزء الخلفي من العضد

Notes *1-The* **skeletal muscles** *that are attached to the* **bones of skeletal system** *(such as the bones of fingers, legs, arms and other body parts)* **contract** *and* **relax** *to allow these bones* **to move**

1- العضلة الهيكلية المتصلة بعظام الهيكل العظمي (مثل عظام الاصابع. الارجل. والاذرع وباقي اجزاء الجسم) تنقبض وتنبسط لتسمح لهذة العظام بالحركة

2-The **muscle** *can only* **exert force** *when it contracts*

2-لا تستطيع العضلة بذل القوة إلا عندما تنقبض

3-The **contraction of muscles** *moves the bones in* **one direction only**

3-إن انقباض العضلات يحرك العظام في اتجاه واحد فقط

4-The **skeletal muscles** *are often* **work in pairs** *and move in opposite directions as shown in the previous example*

4-غالباً ما تعمل العضلات الهيكلية في أزواج وتتحرك في اتجاهين متعاكسين كما هو موضح في المثال السابق.

Exercises on Lesson 2

1- Choose the correct answer:

1. Cells differ from each other in

a. shapes only b. sizes only c. shapes and sizes d. neither shapes nor sizes

2-All the following are from the characteristics of muscle cells, except that they

a. are in the form of long fibers
b. can work alone due to their large sizes
c. must be able to store and use energy quickly
d. can be bundled together to form tissues

3-The muscle is considered as

a. a cell b. a tissue c. an organ d. a system

4-Among the organs of musculoskeletal system are

a. muscles and bones of arm. b. muscles of arm and lungs
c. bones and heart d. lungs and heart

5-Musculoskeletal system allow the body to

a. digest food b. move from place to another
c. transmit nutrients d. exchange oxygen and carbon dioxide

6-Your leg moves due to contraction and relaxation of ……….connected to the bones of leg

a. hairs b. toes c. skin d. muscles

7-When the muscle in front of the upper arm contracts and the muscle in the back of the upper arm relaxes, the forearm moves……………

a. up towards your shoulder b. down towards your shoulder
c. up away from your shoulder d. down away from your shoulder

8-When the muscles in front of the upper arm relax and the muscles in the back of the upper arm contract, the forearm moves…………..

a. up towards your shoulder b. down towards your shoulder
c. up away from your shoulder d. down away from your shoulder

9-The contraction of muscles moves the bones in ……….. only

a. one direction b. two directions c. three directions d. four directions

10-You can move your fingers due to the contraction and relaxation of the skeletal muscles that attached to the of your fingers

a. hairs b. bones c. skin d. nails

11-All the following organs belong to musculoskeletal system, except

a. tendons. b. cartilages. c. veins d. bones

2-Choose from column (B) what suits it in column (A)

(A)	(B)
1- A group of similar cells form	a. organs
2. A group of different tissues form	b. cells
3. A group of different organs form	c. whole body
4. group of different systems form	d. tissues
	e. systems

1-………….. 2-…………… 3-………….. 4-……………

3-Put (√) or (x)

1.A group of different tissues can form a system. ( )
2. Muscle cells are in the form of long fibers to allow movement ( )
3.Muscle cells cannot store and use energy quickly ( )
4-The muscle is formed from bundles of muscle tissues ( )
5. Musculoskeletal system consists of muscular system and digestive system( )
6. The body can move by the help of the skeletal system only ( )
7.The forearm moves up towards your shoulder when the muscle in front of the upper arm contracts ( )
8-Contraction and relaxation of leg muscles allow the bones leg to move ( )
9Musculoskeletal system consists of muscles and bones only ( )

4.Write the scientific term of each of the following:

1. They are cells in the form of long fibers to allow movement(……………..)
2.It is the organ which contracts and relaxes to help in the movement of the body(……………..)
3. The system which helps the body to move. (……………..)
4. They are muscles that attached to the bones of skeletal system(………..)

5-Give reasons for:

1.Muscle cells are in the form of long fibers

……………………………………………………………………………….....

2.Muscle cells don't work alone

……………………………………………………………………………….....

3-Skeletal system cannot do the function of movement without muscular system

……………………………………………………………………………….....

6-What happens to

1-Your leg if the muscles found in it are damaged

……………………………………………………………………………….....

2-The muscles in front of the upper arm and muscles in the back of the upper arm when the forearm moves down away from your shoulder

……………………………………………………………………………….....

7-Look at the following figures, then complete the following sentences:

Figure (A)



Figure (B)

1-The forearm in figure……….. moves up toward your shoulder
2-The forearm in figure……… moves down away from your shoulder
3-The muscles in front of the upper arm contract in figure .... and relax in figure…….
4-The muscles in the back of the upper arm contract in figure...............and relax in figure….

Lesson 3

Activity 6 Mighty Muscles العضلات الجبارة

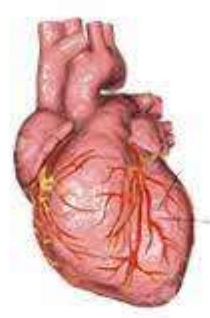
Types of muscles

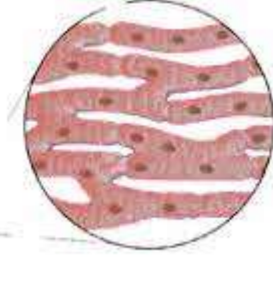
Involuntary muscles العضلات اللاإرادية	**Voluntary muscles** العضلات الإرادية
They are muscles that move automatically and you cannot control their movement هي عضلات تتحرك تلقائيًا ولا يمكنك التحكم في حركتها	*They are muscles that you can control their movement* هي عضلات يمكنك التحكم في حركتها
Examples أمثلة *Cardiac muscle*- عضلة القلب *Eye muscles* عضلات العين -	**Examples** *Skeletal muscles such as* أمثلة العضلات الهيكلية مثل *Upper arm muscles* عضلات الذراع *Neck muscles* عضلات الرقبة *Forearm muscles* عضلات الساعد *Abdomen muscles* عضلات البطن

examples of involuntary and voluntary muscles in details

أمثلة على العضلات اللاإرادية والإرادية بالتفصيل

Carding muscle العضلة القلبية





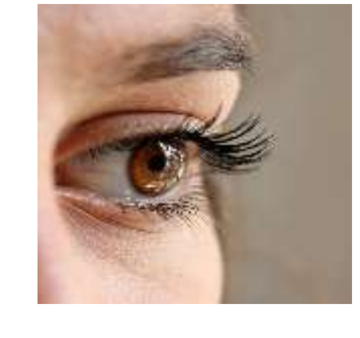
The heart is made *of a type of involuntary muscles known as cardiac muscle*

يتكون القلب من نوع من العضلات اللاإرادية المعروفة باسم عضلة القلب

Cardiac muscle contracts *and* **relaxes** *without stopping*

to allow the heart pumps the blood

-تنقبض عضلة القلب وتسترخي دون توقف لتسمح للقلب بضخ الدم



Eye muscles *Your eyes contain a type of* **Involuntary muscles** *that contract when you close your eyelid* **to allow you blink many times** *in one minute without thinking*

عضلات العين تحتوي عيناك على نوع من العضلات اللاإرادية التي تنقبض عند إغلاق جفنك لتسمح لك برمش عدة مرات في الدقيقة الواحدة دون تفكير

Note *Your eyes also contain voluntary muscles that surround the eyeball to help you move your eyes in different directions*

ملاحظة تحتوي عيناك أيضًا على عضلات إرادية تحيط بمقلة العين لتساعدك على تحريك عينيك في اتجاهات مختلفة

Skeletal muscles العضلات الهيكلية

Upper arm muscles

Bending your elbow depends on two different voluntary muscles, where

عضلات الذراع العليا:-يعتمد ثني مرفقك على عضلتين إراديتين مختلفتين، حيث

When you bend your elbow, *the* **muscle in front** *of your upper arm* **contracts** *and the* **muscle in the back** *of your upper arm* **relaxes**

عندما تثني مرفقك، تنقبض العضلة الموجودة أمام ذراعك العلوي وتسترخي العضلة الموجودة في الجزء الخلفي من ذراعك

When you straighten your elbow, *the muscle in front of your upper arm relaxes and the muscle in the back of your upper arm contracts*

عندما تقوم بفرد مرفقك، تسترخي العضلة الموجودة أمام ذراعك العلوي وتسترخي العضلة الموجودة في ينقبض الجزء الخلفي من ذراعك.

Neck muscles عضلات الرقبة

Moving your head up and down **depends on two important neck voluntary muscles,** *where*

- تحريك رأسك لأعلى ولأسفل يعتمد على عضلتين إراديتين مهمتين في الرقبة، حيث:

When you **move your head up**, **one of these muscles contracts**

عندما تحرك رأسك للأعلى، تنقبض إحدى هذه العضلات.

.When you **move your head down**, *the* **other muscle contracts**

عندما تحرك رأسك للأسفل، تنقبض العضلة الأخرى

Forearm muscles عضلات الساعد

Turning your hand depends *on* **two** *important forearm* **voluntary muscles,** *where*

يعتمد تحريك يدك على عضلتين إراديتين مهمتين في الساعد.:

When you **turn your hand over** *(your palm* **up**), **one of these muscles contracts**

حيث عندما ترفع يدك (راحة يدك للأعلى)، تنقبض إحدى هذه العضلات

When you **turn your hand down** *(your palm* **.down**), *the other* **muscle contracts**

عندما تقوم بتحريك يدك للأسفل (راحة اليد للأسفل)، تنقبض العضلة الأخرى.

Notes *1-When a pair of skeletal muscles perform an action, one muscle contracts, while the other muscle relaxes*

2-All muscles work by contraction

Abdomen muscles عضلات البطن

You have two important abdomen voluntary *muscles on each side of your body known as waist muscles*

لديك عضلتان إراديتان مهمتان في البطن على كل جانب من جسمك تعرفان باسم عضلات الخصر





When you twist your waist to one side, *the two muscles on that side contract together, while the two muscles on the other side relax*

عندما تقوم بتحريف خصرك إلى جانب واحد، تنقبض العضلتان الموجودتان على هذا الجانب معًا، بينما تسترخي العضلتان الموجودتان على الجانب الآخر

Activity 7 Systems Work Together النشاط 7 أنظمة تعمل معًا

How the **structures** *and* **functions** *of some body systems such as* **endocrine system**, **circulatory system** *and* **respiratory system** *work together to help the body gets ready to fight a danger (threat) or to run away from it*

كيف تعمل تركيب ووظائف بعض أنظمة الجسم مثل نظام الغدد الصماء ونظام الدورة الدموية والجهاز التنفسي معًا لمساعدة الجسم على استعداد لخطر الخطر (التهديد) أو الهروب منه

Endocrine system جهاز الغدد الصماء

Its structure: تركيبه

It consists of **glands** *that* **secrete hormones** *that help the body gets ready to* **respond in different situations**

يتكون من غدد تفرز هرمونات تساعد الجسم على الاستعداد للاستجابة في المواقف المختلفة

Its function وظيفتها

It controls the body temperature and the blood pressure

التحكم في درجة حرارة الجسم وضغط الدم

Its role during danger دورها عند الخطر .

عندما يواجه الجسم **When the body faces a danger**, *it gets ready to fight this danger or to run away* خطرًا ، فإنه يستعد لمحاربة هذا الخطر أو الهرب

-**The eyes see the danger and send a signal to the brain,** *then the* **brain sends from it**, *where a signal to the body to respond to that danger.*

-العيون ترى الخطر وترسل إشارة إلى الدماغ ، ثم يرسله الدماغ منه ، حيث إشارة إلى الجسم للرد على ذلك خطر

-*The* **endocrine system** **secretes hormones that control this respond** *and affects other body systems to face that danger or to run away from it, such as:-*

- يفرز جهاز الغدد الصماء هرمونات تتحكم في هذه الاستجابة وتؤثر على أجهزة الجسم الأخرى لمواجهة ذلك الخطر أو الهروب منه مثل:-

-Contraction of muscles　　*-Increasing of breathing rate*

-Increasing of heartbeats

-انقباض العضلات- زيادة معدل التنفس-زيادة دقات القلب

-Circulatory system الجهاز الدوري

Its structure تركيبه

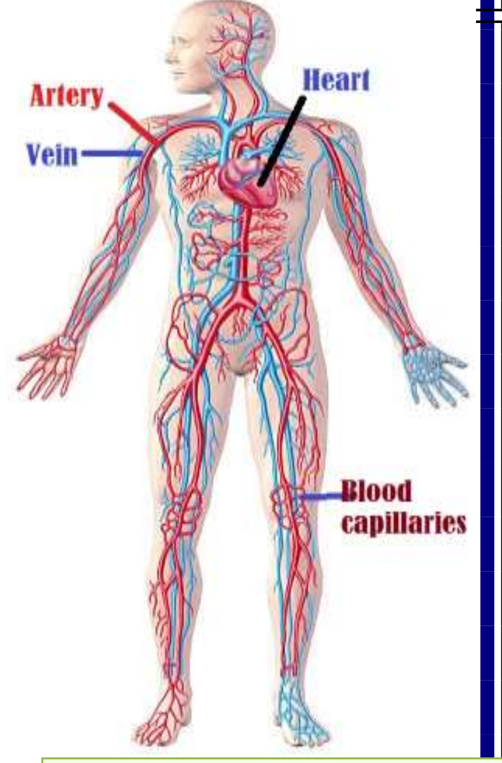
It consists of **heart** *muscle and* **blood vessels** *that* **allow blood to flow through the body**

يتكون من عضلة القلب والأوعية الدموية التي تسمح للدم بالتدفق عبر الجسم

The human circulatory system has **three types of blood vessels** *which are*

Arteries. Veins -Blood capillaries .

يحتوي جهاز الدورة الدموية لدى الإنسان على ثلاثة أنواع من الأوعية الدموية وهي.
الشرايين. الأوردة - الشعيرات الدموية



Human circulatory system

Its function: *It transports blood, gases; nutrients and hormones (secreted by endocrine system) .throughout the body*

وظيفتها: نقل الدم، والغازات؛ العناصر الغذائية والهرمونات (التي يفرزها جهاز الغدد الصماء) في جميع أنحاء الجسم.

Its role during danger دورها أثناء الخطر

When the body faces a danger, *the heart begins to beat quickly, so the heartbeats increase causing*

- عندما يواجه الجسم خطراً ما، يبدأ القلب بالنبض بسرعة، فتزداد نبضات القلب مما يسبب

.**The heart pumps more blood to the muscles,** *the heart and the other organs*

- يضخ القلب المزيد من الدم إلى العضلات، القلب وسائر الأعضاء.

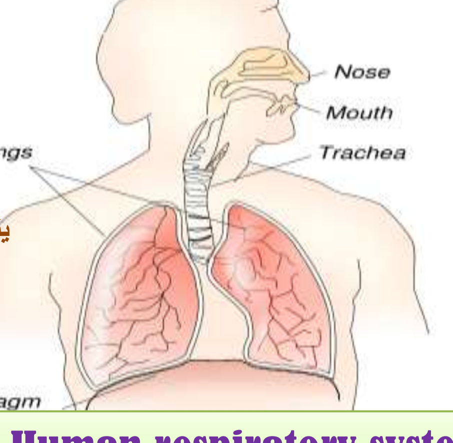
. *The blood pressure increases* -يرتفع ضغط الدم. -

Respiratory system الجهاز التنفسي

Its structure تركيبه

It consists of **lungs**, **diaphragm** *and* **airways** *(such as trachea and bronchi)*

يتكون من الرئتين، والحجاب الحاجز، والممرات الهوائية (مثل القصبة الهوائية والشعب الهوائية).



Human respiratory system

:Its function وظيفتها

It **provides the body with oxygen gas** *and gets rid of carbon dioxide gas*

يمد الجسم بغاز الأكسجين ويتخلص من غاز ثاني أكسيد الكربون

:Its role during danger • دوره أثناء الخطر

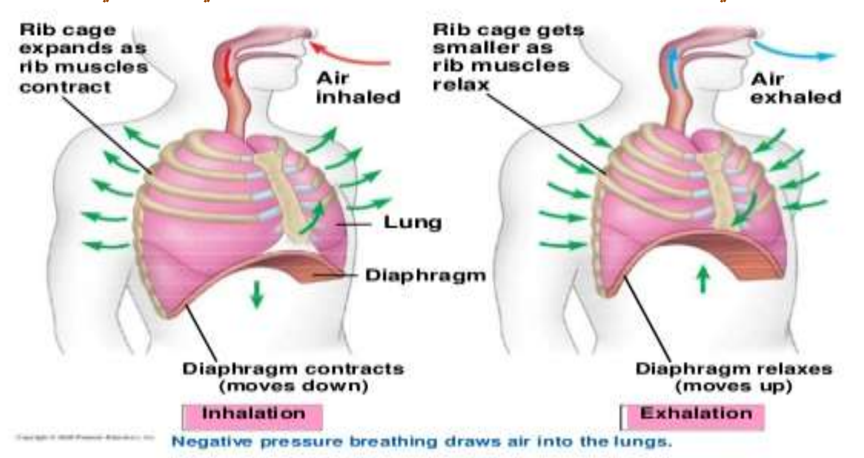
يعتمد الجهاز الدوري *The circulatory system depends on the lungs to do its function, where* على الرئتين للقيام بوظيفته، حيث

-When the **diaphragm muscle contracts**, *the lungs take in the air rich in oxygen gas*

- عندما تنقبض عضلة الحجاب الحاجز، تستنشق الرئتان الهواء الغني بغاز الأكسجين

W-hen the **diaphragm muscle relaxes**, *the lungs release the air rich in carbon dioxide gas*

وعندما تسترخي عضلة الحجاب الحاجز، تطلق الرئتان الهواء الغني بغاز ثاني أكسيد الكربون.



Negative pressure breathing draws air into the lungs.

The **bloodstream carries oxygen** *from* **lungs** *to all the* **body organs** *and other* **tissues**

يحمل مجرى الدم الأكسجين من الرئتين إلى جميع أعضاء الجسم والأنسجة الأخرى.

When the body faces a danger, *the* **breathing rate increases** *and the* **heartbeats increase** *to allow the body to* **send more oxygenated blood** *to the muscles and brain*

عندما يواجه الجسم خطراً ما، يزداد معدل التنفس وتزداد نبضات القلب للسماح للجسم بإرسال المزيد من الدم المؤكسج إلى العضلات والدماغ

different body systems work together *to help the body* **respond to the danger**, *where:*

-**The endocrine system** *releases* **hormones** *to fight the danger or to run away from it*

تعمل أجهزة الجسم المختلفة معًا لمساعدة الجسم على الاستجابة للخطر، حيث: يقوم جهاز الغدد الصماء بإفراز هرمونات لمحاربة الخطر أو الهروب منه.

-**The circulatory system** *pumps* **blood** *quickly around the body carrying* ,**oxygen nutrients** *and* **hormones** *to cells*

يقوم الجهاز الدوري بضخ الدم بسرعة حول الجسم حاملاً الأوكسجين ، المواد المغذية و الهرمونات إلى الخلايا

. **The respiratory system** *provides different organs with* **oxygen** *such as muscles and brain*

. يقوم الجهاز التنفسي بتزويد الأعضاء المختلفة بالأكسجين مثل العضلات والدماغ.



Exercises on Lesson 3

1- Choose the correct answer:

1. Among the muscles which you cannot control their movement are……..

a. hand muscles b. eyelid muscles. c. leg muscles d. arm muscles

2-Cardiac muscles are type of involuntary muscles which form the………..

a. stomach b. intestine c. lungs d. heart

3-Muscles of heart…………. to pump the blood carrying oxygen to all body cells

a. contract only b. relax only

c. contract and relax d. neither contract nor relax

4-Among the organs which contain both involuntary and voluntary muscles is the…..

a. heart b. arm c. eye d. leg

5-Skeletal muscles work in pairs when

a. moving your hands towards your shoulder b. pumping blood to all the body parts

c. transmitting food to all the body parts d. closing your eyelid to allow you blink.

6. The system which helps your body gets ready to respond in different situations by secreting hormones is the ………….system

a. digestive b. endocrine c. circulatory d. nervous

7. Among the functions of endocrine system is………..

a. transmitting food to the nervous system b. controlling the muscles of stomach

c. controlling the body temperature and blood pressure

d. providing the muscular system with its needed food.

8. All the following are happened by the help of endocrine system to face or to run away from danger, except

a contraction of your muscles b. increasing your breathing rate

c. increase your heartbeats d. digest of food that you eat

9-All the following are from types of blood vessels, except

a. arteries b. heart c. veins d. blood capillaries

10-Circulatory system can transport all the following substances through all the body parts except

a. nutrients b. gases c. hormones d. bones

11-When you face a dangerous situation, circulatory system do all the following. except

a. your heartbeats increase b. muscles of your body relax

c. heart pumps more blood to the muscles d. the blood pressure increases

12-Among the organs which belong to respiratory system is…..

a. stomach b. heart c. lung d. brain.

13. The system which provides your body with oxygen gas and gets rid of carbon dioxide gas is ………system

a. respiratory b. nervous c. endocrine d. circulatory

14. The lungs take in air when the diaphragm……………, while they release the when the diaphragm…………

a. contracts-contracts b. contracts-relaxes c. relaxes-relaxes d. relaxes-contracts

15-The system which helps the respiratory system in transporting oxygen gas from lungs to all the body organs is the………… system.

a. digestive b. nervous c. endocrine d. circulatory

16-All the following muscles work in pairs as one muscle contracts, while the other muscle relaxes, except the………….

a. upper arm muscles b. cardiac muscles c. neck muscles d. forearm muscles

2-Put (√) or (x)

1. Cardiac muscles are considered as voluntary muscles. ( )
2.Heart is made of a type of involuntary muscles known as skeletal muscles( )
3.Cardiac muscles contract and relax all the time without stopping. ( )
4. The muscles that help you move your eyes in different directions are considered as voluntary muscles ( )
5. All skeletal muscles are considered as involuntary muscles and work by contraction ( )
6. Endocrine system secretes hormones that control the increasing of your breathing rate during danger ( )
7.The heart begins to beat quickly during normal situations ( )
8. When the heartbeats increase, the blood pressure increases also. ( )
9. Trachea is the only airway through which oxygen passes to reach the lungs ( )
10. In dangerous situations, the body sends more oxygenated blood to the muscles and brain to face the danger ( )
11.Blood transports oxygen gas only to all the body organs and tissues ( )
12.Forearm muscles are considered as voluntary muscles ( )

3-Write the scientific term of each of the following

1.They are muscles that move automatically and you cannot control their movement (……………….)
2. They are muscles that you can control their movement (……………….)
3.A type of involuntary muscles which form the heart that contract and relax all time without stopping (……………….) (…………….)
4.They are muscles which allow the movement of the bones of skeletal system
5. It is the system that secretes hormones to control the body temperature and the blood pressure(……………….)
6. It is the system which consists of the heart and blood vessels that allow blood to flow through the body(……………….)
7.It is the system which consists of lungs and other airways(……………….)

4-Give reasons for

1-Cardiac muscles are considered as involuntary muscles
…………………………………………………………………………………
2-Cardiac muscles contract and relax without stopping
…………………………………………………………………………………
3-The muscles that surround the eyeball are considered as voluntary muscles
…………………………………………………………………………………
4-When the body faces a danger, the heartbeats increase
…………………………………………………………………………………

5-What happens to

1-The human body if the cardiac muscles don't contract and relax for a long period of time
…………………………………………………………………………………
2-The human body when the heartbeats increase during danger
…………………………………………………………………………………
3-The lungs when the diaphragm muscle contracts
…………………………………………………………………………………

Lesson 4

Activity 8 Getting fuel الحصول على الوقود

Getting fuel (energy) الحصول على الوقود (الطاقة)

The body systems work together to keep the body working in a correct way

تعمل أجهزة الجسم معًا للحفاظ على عمل الجسم بطريقة صحيحة

*So, **these systems need energy** from food we eat **to do their functions***

لذا، تحتاج هذه الأجهزة إلى الطاقة من الطعام الذي نتناوله للقيام بوظائفها

Food contains *different* **nutrients** *such as:* **carbohydrates**, **fats** *and* **proteins**

يحتوي الطعام على عناصر غذائية مختلفة مثل: الكربوهيدرات والدهون والبروتينات

The complex nutrients *must be* **converted** *into* **simpler substances** *before they can be used by body cells*

ويجب على العناصر الغذائية المعقدة أن يتم تحويلها إلى مواد أبسط قبل أن تتمكن خلايا الجسم من استخدامها

The human digestive system *converts the complex food into simpler*

يقوم الجهاز الهضمي البشري بتحويل الطعام المعقد إلى أبسط

Digestion process **(process by which the complex food convert into simpler substances that the body can use for energy and growth**

عملية هضم (عملية يتحول من خلالها الطعام المعقد إلى مواد أبسط يمكن للجسم استخدامها للطاقة والنمو)

Note Inside the cells, *some of simpler substances are used in cellular respiration process*

ملاحظة داخل الخلايا، توجد بعض المواد الأبسط تستخدم في عملية التنفس الخلوي

1

-**Digestion begins** *when you put food in your mouth.*

- تبدأ عملية الهضم عندما تضع الطعام في فمك.

-**Jaw muscles** *move to help your teeth to chew the food*

-تتحرك عضلات الفك لتساعد أسنانك على مضغ الطعام

Chewing **breaks up the food** *into* **smaller parts** ***to help chemicals (enzymes) secreted by endocrine system*** *to digest food easily*

يؤدي المضغ إلى تفتيت الطعام إلى أجزاء أصغر لمساعدة المواد الكيميائية (الإنزيمات) التي يفرزها جهاز الغدد الصماء على هضم الطعام بسهولة

When you chew food, **saliva** *(a liquid in your mouth that contains enzyme) can easily* **soften the food** *and begins the chemical breakdown of food*

عند مضغ الطعام، يمكن للعاب (السائل الموجود في فمك والذي يحتوي على إنزيم) أن يلين الطعام بسهولة ويبدأ في التحلل الكيميائي للطعام

2

After you swallow the food, *muscles* **push it down** *to your* **esophagus**, *then to* **stomach**

بعد أن تبتلع الطعام، تدفعه العضلات إلى أسفل إلى المريء، ثم إلى المعدة

-The continuous churning movement of the **stomach** *and secreting the stomach's* **digestive fluids** *that contain an* **acid** *and some* **enzymes** *leads to more* **food breakdown**

- إن حركة المعدة المستمرة المتماوجة وإفراز السوائل الهضمية في المعدة التي تحتوي على حمض وبعض الإنزيمات تؤدي إلى المزيد من تفتيت الطعام

Enzymes secreted *from* **pancreas** *and* **gallbladder** *help in the chemical* **breakdown of food** *once it moves into the small intestine.*

تساعد الإنزيمات المفرزة من البنكرياس والمرارة في التحلل الكيميائي للطعام بمجرد انتقاله إلى الأمعاء الدقيقة.

3

Absorption *of nutrients (digested food) starts in the* **small Intestine**

يبدأ امتصاص العناصر الغذائية (الطعام المهضوم) في الأمعاء الدقيقة.

The walls of the **small intestine absorb** *these* **nutrients** *through* **blood vessels** *to carry them to all the* **body parts**

وتمتص جدران الأمعاء الدقيقة هذه العناصر الغذائية عن طريق الأوعية الدموية لتحملها إلى جميع

The undigested *food is passed to the* **large intestine** *which is also known as* **colon** *as a* **soupy mixture**

ينتقل الطعام غير المهضوم إلى الأمعاء الغليظة والتي تعرف أيضًا بالقولون كخليط حساء

4

Then, the **large intestine absorbs** *most of* **water** *from the undigested food that leaves the body as solid mass known as feces or stool*

ثم تمتص الأمعاء الغليظة معظم الماء من الطعام غير المهضوم الذي يترك الجسم على شكل كتلة صلبة تعرف بالبراز أو البراز

The last part of the large intestine *is known as* **rectum** *that* **stores the feces until it leaves the body.**

الجزء الأخير من الأمعاء الغليظة يعرف بالمستقيم الذي يخزن البراز حتى يخرج من الجسم.

The feces leaves the body through *a muscular opening at the end of the rectum known as* **anus**

يخرج البراز من الجسم من خلال فتحة عضلية في نهاية المستقيم تعرف باسم فتحة الشرج.

Transporting nutrients نقل العناصر الغذائية

Nutrients are transported *to different organs* **through** *the* **circulatory system**

يتم نقل العناصر الغذائية إلى أعضاء مختلفة من خلال الدورة الدموية

Some **nutrients** *are used at once and others are* **stored** *as* **sugar** *and* **fats** *.*

يتم استخدام بعض العناصر الغذائية مرة واحدة ويتم تخزين البعض الآخر على شكل سكر ودهون .

Example مثال

The liver *and* **muscles** *can* **store glucose** *sugar and* **convert** *it into a special storage substance called* **glycogen**

يستطيع الكبد والعضلات تخزين سكر الجلوكوز وتحويله إلى مادة تخزين خاصة تسمى الجليكوجين

The liver *and* **muscles convert glycogen** *into* **glucose** *sugar again and release it* **when** *your body* **needs energy**

يقوم الكبد والعضلات بتحويل الجليكوجين إلى سكر جلوكوز مرة أخرى و يطلقها عندما يحتاج جسمك إلى الطاقة

Your body **needs this energy** *when you are* **exposed to a danger** *situation to fight this danger or to run away from it*

يحتاج جسمك إلى هذه الطاقة عندما تتعرض لموقف خطير لمحاربة هذا الخطر أو الهروب منه

Activity 9 The Excretory System النشاط 9 جهاز الإخراج

The body must get enough food, water *and* **air** *to do its function in a correct way*

يجب أن يحصل الجسم على ما يكفي من الغذاء والماء والهواء للقيام بوظيفته بطريقة صحيحة

Not all the materials we eat are useful. *Also,* **some of the vital processes** *that occur in our bodies* **produce waste materials**

ليست كل المواد التي نتناولها مفيدة. كما أن بعض العمليات الحيوية التي تحدث في أجسامنا تنتج فضلات

How does the body get rid of these waste materials

كيف يتخلص الجسم من هذه النفايات

The waste materials leave the body through the excretory system *in a process called excretion process*

تخرج النفايات من الجسم عن طريق الجهاز الإخراجي في عملية تسمى عملية الإخراج

Excretory system الجهاز الإخراجي

It is a system that is responsible for **storing** *and* **getting rid** *of* **waste materials produced** *from cells*

هو الجهاز المسؤول عن تخزين والتخلص من النفايات التي تنتجها الخلايا

Excretion process عملية الإخراج

important vital processes *inside the body, where the excretory system* **collects the waste materials produced** *by cells and* **removes them** *from the body*

عملية حيوية مهمة داخل الجسم، حيث يقوم الجهاز الإخراجي بجمع النفايات التي ينتجها الخلايا ويخرجها من الجسم

The excretion process *is* **necessary to remove the waste materials resulting from burning food inside the body cells** *through their membranes*

عملية الإفراز ضرورية لإزالة الفضلات الناتجة عن حرق الطعام داخل خلايا الجسم عن طريق أغشيتها

Notes ملاحظات

1-If your body **doesn't get rid of waste**, *you will get* **sick**

1-إذا لم يتخلص جسمك من الفضلات، فأنت سوف يمرض

2-The **digestive system doesn't share in excretion process,** *where it doesn't work on the waste materials produced from burning food inside the body cells*

2-لا يشارك الجهاز الهضمي في عملية الإخراج، حيث لا يعمل على الفضلات الناتجة عن حرق الطعام داخل خلايا الجسم.

What are the body parts responsible for excretion process

1-Skin *When you sweat, waste leaves the body through pores in your skin*

1-الجلد عندما تتعرق، تخرج الفضلات من الجسم من خلال المسام الموجودة في جلدك

2- Respiratory system

When you exhale, your body gets rid of is carbon dioxide

2- الجهاز التنفسي عند الزفير، يتخلص جسمك ثاني أكسيد الكربون

3- Urinary system - الجهاز البولي

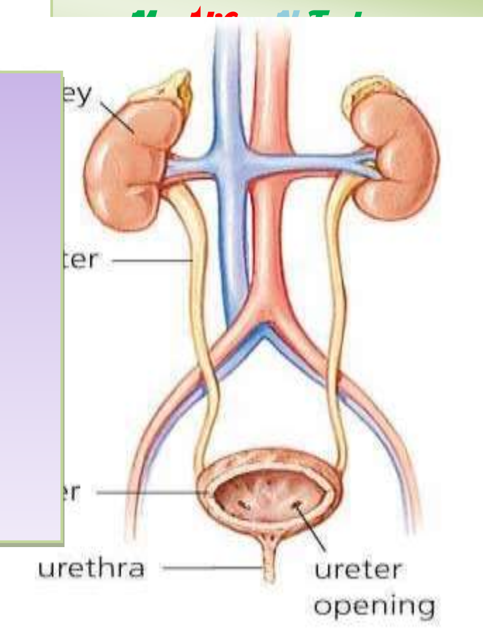
تركيبه Its structure:

It consists of -Two kidneys -Ureters Bladder -Urethra

يتكون من - كليتين - حالب - مثانة - مجرى البول

Its function It removes waste materials from the blood in the form of urine

وظيفته إزالة الفضلات من الدم على شكل بول



Urinary system الجهاز البولي

كليتان Two kidneys

they continuously clean and **filter the blood** up to 300 times a day, where

تقومان بتنظيف وتصفية الدم بشكل مستمر حتى 300 مرة في اليوم، حيث

.A large **artery** **brings blood** to each kidney

شريان كبير ينقل الدم إلى كل كلية.

Tiny **blood vessels branch** off and pass **through each nephron** which is a **microscopic filter that filters** the blood and **removes harmful substances** from the body

تتفرع الأوعية الدموية الصغيرة ويمر عبر كل نيفرون وهو مرشح مجهري يقوم بتصفية الدم وإخراج المواد الضارة من الجسم.

the most important waste materials removed by the kidney is called **urea** .which is formed due to the **breakdown of proteins** inside the body cells

ومن أهم النفايات التي تزيلها الكلى ما يسمى باليوريا والتي تتكون بسبب تحلل البروتينات داخل الجسم. خلايا الجسم.

After the filtering is completed **urea**, other **waste materials** and **water** become **urine**

بعد الانتهاء من تصفية اليوريا، تتحول مواد النفايات الأخرى والماء إلى بول.

Urine leaves each **kidney** through a narrow tube called **ureter** and **collects in .the bladder**

يخرج البول من كل كلية من خلال أنبوب ضيق يسمى الحالب ويتجمع في المثانة.

Urine is removed from the **bladder** through another tube called the **urethra**

تتم إزالة البول من المثانة من خلال أنبوب آخر يسمى مجرى البول.

ملاحظات Notes

1- Blood cells and proteins are too large to pass through the filter (nephron), so they stay in the body.

1- خلايا الدم والبروتينات كبيرة جدًا بحيث لا يمكنها المرور عبر المرشح (النفرون)، لذلك تبقى في الجسم.

2. Urination is the process of **expelling urine from the body**

2. التبول هو عملية طرد البول من الجسم

Exercises on Lesson 4

1- Choose the correct answer:

1. The systems of the human body get their needed energy from ……..

a. the Sun. b. water c. food d. carbon dioxide

2-All the following are from the nutrients that the food contains, except

a. carbohydrates b. oxygen gas c. fats d. proteins

3-The system which converts the complex food into simpler substances that the body can use for energy and growth is the………. system

a. respiratory b. nervous c. circulatory d. digestive

4-You can use your ………..muscles to help the teeth chew the food

a. eye b. cardiac c. jaw d. hand

5-The system which helps the digestive system during chewing the food by secreting enzymes in your mouth is the.......... system

a. endocrine b. circulatory c. respiratory d. nervous

6-The function of saliva inside your mouth is

a. cutting up the food into smaller parts
b. softening the food and breaking it down
c. transporting the food into stomach
d. transporting the food through body organs

7-The organ which belongs to the digestive system and secretes fluids contain an acid and some enzymes is the …………

a esophagus. b. stomach. c. small intestine. d. mouth

8-In small intestine,……. help(s) in breaking down of food by secreting some enzymes

a. pancreas only b. gallbladder only
c. pancreas and gallbladder d. pancreas and lungs

9-Absorption of nutrients inside the body starts in the……. organ

a. large intestine b. small intestine c. heart d. stomach

10-Walls of small intestine contain ……..which responsible for absorbing nutrients

a. blood vessels b. hairs c. glands d. nephrons

11-blood carries…………. formed Inside small intestine to all the body organ

a. feces b. undigested food c. bones d. nutrients

12- The large intestine absorbs ………from the undigested food

a. nutrients b. water c. blood d. urea

13-The part of large intestine which stores the feces until it leaves the body is the….

a. rectum b. colon c. esophagus d. anus

14- The organs which can store glucose and convert it into glycogen are……

a. liver and pancreas b. muscles and stomach
c. esophagus and stomach. d. liver and muscles

15. The system which helps the digestive system in transporting the nutrients to all different body organs is the………… system

a. nervous b. respiratory c. circulatory d. excretory

16-The body gets rid of waste materials by……… process

a. digestion b. excretion c. respiration d. sensation

17-The excretion process is necessary to………

a. digest the food that you eat
b. allow your body to move
c. transport the nutrients inside your body
d. remove the waste products from your body

18-All the following are responsible for excretion process, except

a digestive system. b. skin c. respiratory system d. urinary system

19-The organ which is responsible for secreting sweat is the

a esophagus. b. stomach c. skin d. kidney

20-All the following are from the waste materials which are produced by your body except

a. urine b. oxygen gas c. carbon dioxide d. sweat

21- Among the organs which belong to urinary system are

a. stomach and kidneys b. ureters and gallbladder .
c. kidneys and bladder d. urethra and heart

22-The two kidneys play an important role in the filtration of………. inside your body

a. water b. enzyme c. acid d. blood

23-The blood which carries the waste materials, enters each kidney through a large….

a. vein b. artery c. blood capillary. d. ureter

24-Urea is formed due to the breaking down of ……….inside the body cells

a. carbohydrates b. fats c. acids d. proteins

25-The tube which transports the urine from the kidney to the bladder is the

a. vein b. urethra c. ureter d. artery

26-The process of expelling urine from the body is called process

a. urination b. respiration c. digestion d. sensation

2-Put (√) or (x):

1- Systems get their needed energy from the food we eat ( )
2-The simple substances must be converted into complex nutrients to be used by the body cells. ( )
3. Digestion begins when the food enters esophagus ( )
4-Saliva is a liquid which is secreted by endocrine system inside your mouth( )
5-The acid and enzymes which are secreted inside stomach lead to more breaking down of food ( )
6-Inside large intestine, enzymes which are secreted from pancreas and gallbladder help in the chemical breakdown of food ( )
7-Absorption of digested food starts in the small intestine. .( )
8. The digested food enters the colon as a soupy mixture ( )
9-Colon absorbs most of water from the undigested food that leaves the body( )
10-The feces leaves the body through a bony opening known as anus ( )
11. Circulatory system transports the digested food to different body organs( )
12-All nutrients that are absorbed from small intestine are stored as fats inside the body ( )
13-Glycogen is converted into glucose and stored in liver and muscles ( )
14-When your body needs energy, liver and muscles convert glycogen into glucose again ( )
15-Excretion process is necessary to convert complex food into simpler substances ( )

16-If your body doesn't get rid of waste, you will be healthy ( )
17-The main waste product which is expelled by respiratory system is the urea ( )
18-The two kidneys remove waste materials from the ( )
19-Nephron helps in the filtration of blood from urea ( )
20-Urine is expelled outside the body through urethra ( )
21-Blood cells and proteins are too small, so they can pass through the nephrons of kidneys ( )

3-Write the scientific term of each of the following

The system which converts the complex food into simpler substances that the body can use to get energy (………………)
2. The process of breaking down the complex food into simpler substances (………………)
process 3-A liquid in your mouth contains an enzyme which helps in digestion (………………)
4. An organ in which absorption of nutrients starts (………………)
5-The organ which absorbs most of water from the undigested food
6-. The last part of large intestine that stores the feces until it leaves the body (………………)
7-A substance that is stored in liver and muscles, then converted into glucose when your body needs energy (………………)
8-It is a system that is responsible for storing and getting rid of waste materials produced from cells waste materials produced from cells(…………………)
9-It is the process of removing the waste products resulting from burning food inside the body cells through their membranes(………………)
10-The organ which helps in excretion of sweat through the pores that are found in it (………………)
11. The system that is responsible for excretion of carbon dioxide gas (………………)
12-It is a microscopic filter that is found in the two kidneys and filters the blood from waste materials (………………)
13-A substance which is formed due to the breakdown of proteins inside the body cells (………………)
14-It is the process of expelling urine from the body (………………)

4 -Give reasons for:

1-The body needs to convert complex food into simpler substance
……………………………………………………………………..….
2-Saliva plays an important role in digestion of food Inside the mouth
……………………………………………………………………..….
3-Stomach secretes a digestive fluid when the food reach it.
……………………………………………………………………..….
4-Walls of small intestine contain blood vessels
……………………………………………………………………..….
5-Undigested food becomes solid wastes inside the large intestine
……………………………………………………………………..….

6-The liver and muscles convert the stored glycogen into glucose sugar

……………………………………………………………………………

7-Importance of excretion process to your body

……………………………………………………………………………

8. The digestive system doesn't share in excretion process

……………………………………………………………………………

9-The two kidneys contain many nephrons

……………………………………………………………………………

10-Formation of urea inside the body of human1

……………………………………………………………………………

5-What happens If

1-Complex nutrients don't convert into simple substances inside your body

……………………………………………………………………………

2-Saliva is not secreted during chewing the food inside your mouth

……………………………………………………………………………

3-Pancreas and gallbladder don't secrete their enzymes in small intestine

……………………………………………………………………………

4-Your body doesn't get rid of waste

……………………………………………………………………………

5-The blood that carries waste materials passes through nephrons of the two kidneys

……………………………………………………………………………

6-Look at the following diagrams that represent the sharing of some body systems to do some processes, then use the words below to complete the following sentences

(respiratory system - skin - urinary system - circulatory system)

1-Letter (A) represents …………..

2-Letter (8) represents …………

3-Letter represents ……………

4-Letter (6) represents …………..

A B C

Excretion process.

D A

Transportation of waste materials and urination process.

B D

Respiration process and transportation of gases.

7-Write each of the following organs below the system that belongs to : (Heart-Lungs - Kidneys - Stomach)

1-………………. 2-………………. 3-……………… 4-…………

.

Lesson 5

Activity 10 Getting Rid of Waste التخلص من الفضلات

The kidney *is a filtering system for the blood* الكلى هي نظام تصفية للدم -

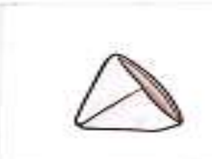
So, **engineers design special devices** *for people whose kidneys are not working property. -These devices filter the blood to remove waste materials*

لذا قام المهندسون بتصميم أجهزة خاصة للأشخاص الذين لا تعمل كليتهم بشكل جيد. - تقوم هذه الأجهزة بتصفية الدم لإزالة الفضلات

an experiment to show how the kidney model is similar to the real kidney to filter the blood from waste materials

تجربة لتوضيح كيف يشبه نموذج الكلى الكلية الحقيقية في تصفية الدم من الفضلات

Tools


Cone-shaped filter (represents the nephron)


Beaker


Funnel


Water

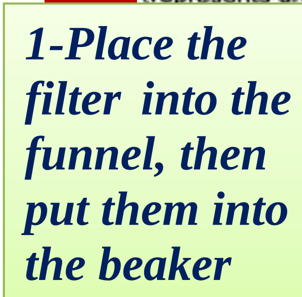

Some salt (represents urea


Some red kidney beans ...ent bl


Some rice

Steps

1-Place the filter into the funnel, then put them into the beaker



2-Dissolve the salt into the water



3- Add the red kidney beans and rice into the water



4- Pour the mixture into the filter



Observations ملاحظات

The water that contains salt (they represent the urine) passes through the filter

الماء الذي يحتوي على ملح (يمثل البول) يمر عبر الفلتر

The red kidney beans and the rice don't pass through the filter

الفاصوليا الحمراء والأرز لا يمران عبر الفلتر

الخلاصة Conclusion

The kidneys work as a filtering system *for the blood, where: When the blood enters the kidneys,* **they remove some waste materials** *that come out as urine*

تعمل الكلى كنظام تصفية للدم، حيث : عندما يدخل الدم إلى الكلى، فإنها تزيل بعض الفضلات التي تخرج على شكل بول

Blood *cells and* **proteins** *are* **too large**, *so they* **don't pass** *through - the kidneys' nephrons*

-خلايا الدم والبروتينات كبيرة جدًا، لذا لا تمر عبر نفرونات الكلى

Note *Studying a kidney model instead of a real kidney saves time, money and effort, and saves*

ملاحظة دراسة نموذج الكلى بدلاً من ذلك الكلية الحقيقية توفر الوقت والمال والجهد وتوفر

Activity 11 Systems Working Together الأنظمة تعمل معًا

different body systems must work together *to get energy and nutrients from food we eat to keep the body healthy*

أجهزة الجسم المختلفة يجب أن تعمل معًا للحصول على الطاقة والمواد المغذية من الطعام الذي نتناوله للحفاظ على صحة الجسم

Each system depends on all the other systems, *where if one system does not do its function, the other systems will not able to do their functions well*

يعتمد كل نظام على جميع الأجهزة الأخرى، حيث إذا لم يقوم أحد الأنظمة بوظيفته، فإن لن تتمكن الأنظمة الأخرى من أداء وظائفها بشكل جيد

Exercises on Lesson 5

1- Choose the correct answer:

1. Engineers design special devices to work instead of ….. blood from waste materials

a . stomach   b. heart   c. kidney   d. lung

2-Nephrons play an important role in

a. secreting hormones to control the body functions
b. controlling the movement of body from place to another
c. breaking down the complex food into simple nutrients
d. filtering the blood from waste materials

3-Among the substances which cannot pass through the kidneys' nephrons are

a. blood cells and urea   *b. blood cells and proteins*
c. proteins and urea   *d. water and urea*

4-Urination process happens by the help of………….system

a. digestive   *b. urinary*   *c. respiratory*   *d. skeletal*

5-The two kidneys remove waste materials as…….and expel them in the form of urine

a. water and urea   *b. urea and blood cells*
c. water and proteins   *d. proteins and blood cells*

2-Put (√) or (X):

1-Kidneys are considered as a filtering system for the blood ( )
2-People whose kidneys are not working properly must use other devices to filter their blood from waste ( )
3-Proteins can pass through nephrons during filtration of blood in the two kidneys ( )
4-Studying a kidney model can save time, money and effort
5-The two kidneys remove waste materials from undigested food which come out in the form of urine ( )

3-Complete the following sentences using the words below:

(kidney model-proteins-blood-urine-nephrons-urea)
1-People whose kidneys are not working well, their……cannot be filtered well
2-Some substances can pass through nephrons as…………. while other substances cannot pass through nephrons as…………..
3. The microscopic filters which are found inside the two kidneys are called ………………..
4-We can save people's life when studying a……… instead of a real kidney
5- Waste materials that are removed by the help of urinary system are coming out in the form of……

4-Give a reason **Blood cells and proteins cannot pass through the kidney's nephrons**

……………………………………………………………………………………….

5-What happens if **The blood does not pass through the two kidneys during its circulation inside the human body**

……………………………………………………………………………………….

Lesson 6

Record Evidence Like a Scientist سجل الأدلة مثل العالم

different systems in the human body that work her to help the .body pots ready to fight a danger or to run away from it

الأنظمة المختلفة في جسم الإنسان تعمل على مساعدة أواني الجسم على الاستعداد لمحاربة الخطر أو الهروب منه.

Now, try to think Ikea scientist by writing your claim, your evidence and your scientific about one of the main points of this concept through the four

الآن، حاول أن تفكر في عالم ايكيا من خلال كتابة ادعاءك وأدلتك وحججك العلمية حول إحدى النقاط الرئيسية لهذا المفهوم من خلال الأربعة

The Question How does your body taction as a system

Step 1 My Claim……………………………………………...

Step 2 My Evidence…………………………………………...

Step 3 My Scientific Explanation………………………………



Activity 13 TEM in Action _ مرض السكري

Diabetes disease

The function of endocrine system *is to produce* **hormones** *that regulate vital processes in the body*

وظيفة جهاز الغدد الصماء هي إنتاج الهرمونات التي تنظم العمليات الحيوية في الجسم

Diabetes disease *is one of the disorders of the endocrine system•*

•مرض السكري هو أحد اضطرابات جهاز الغدد الصماء

People with diabetes disease are **unable to make or use insulin**, *so sugar stays in the blood and causes many problems*

الأشخاص المصابون بمرض السكري غير قادرين على إنتاج أو استخدام الأنسولين فيبقى السكر في الدم ويسبب العديد من المشاكل



Pancreas *is one of the organs of endocrine system that produces insulin hormone. where*

البنكرياس هو أحد أعضاء جهاز الغدد الصماء الذي ينتج هرمون الأنسولين. حيث

If pancreas does its function correctly, *it - produces the right amount of insulin to regulate the sugar level in blood.*

-إذا قام البنكرياس بوظيفته بشكل صحيح، فإنه ينتج الكمية المناسبة من الأنسولين لتنظيم مستوى السكر في الدم

.



-If pancreas doesn't do its function correctly, *people will be infected with diabetes disease. - So, these people must monitor the level of sugar in their blood and not allow it to get too low or too high*

- إذا لم يقوم البنكرياس بوظيفته بشكل صحيح، فسيصاب الإنسان بمرض السكري. - لذا، يجب على هؤلاء الأشخاص مراقبة مستوى السكر في الدم وعدم السماح له بالانخفاض أو الارتفاع الشديد.

Note ملحوظة

Insulin hormone *regulates the amount of sugar that the body can use for energy*

ينظم هرمون الأنسولين كمية السكر التي يمكن أن يستخدمها الجسم للحصول على الطاقة

How to use technology to treat diabetes? كيفية استخدام التكنولوجيا لعلاج مرض السكري

There are many kinds of technologies used to treat diabetes and for diabetics to monitor their condition from home

هناك أنواع كثيرة من التقنيات المستخدمة لعلاج مرض السكري ولمرضى السكر لمراقبة حالتهم من المنزل.

Diabetics *must give themselves regular shots (doses) of insulin.*

مرضى السكر يجب أن يعطوا أنفسهم جرعات منتظمة من الأنسولين.

An insulin pump *is a device attached to the body to help diabetics control the blood sugar levels with automatic injections of insulin*

مضخة الأنسولين هي جهاز متصل بالجسم لمساعدة مرضى السكري على التحكم في مستويات السكر في الدم عن طريق الحقن التلقائي للأنسولين

Note ملاحظة

Researchers are now working to develop an artificial pancreas, so • .people infected with diabetes don't need the external pump

•يعمل الباحثون الآن على تطوير بنكرياس صناعي، لذلك لا يحتاج المصابون بمرض السكري إلى مضخة خارجية.

Exercises on Lesson 6

1- Choose the correct answer:

1. Diabetes disease occurs due to a disturbance in one organ of ………system

a. respiratory b. nervous c. endocrine d. urinary

2-The organ which is responsible for secreting insulin hormone is the………

a. gallbladder. b. pancreas c. liver d stomach

3-Insulin hormone is responsible for regulating the level of……… in blood

a. proteins b. fats c. water d. sugar

4-Pancreas belongs to….. system and its secretions help in completing ………process

a endocrine-digestion b. circulatory-respiration

c. digestive-urination d. endocrine-sensation

5. People who suffer from diabetes can use the insulin pump device that injects the body automatically with…………..

a. sugar b. water c. insulin d. carbohydrates

2-Put (√) or (X):

1- Diabetes disease is one of the disorders of the respiratory system ( )

2-Pancreas secretes hormone to regulate sugar level in the blood ( )

3. If pancreas cannot do its function correctly, the sugar level in blood doesn't affect ( )

4.The body uses sugar to get its needed energy ( )

5. The insulin pump device helps diabetics control the water level in the blood with automatic injections of insulin ( )

6-Researchers are working to develop an artificial pancreas instead of the insulin pump device ( )

3- Write the scientific term of each of the following:

1. The organ that is responsible for regulating the sugar level in blood (………………..)

2-A hormone that controls the level of sugar in the human blood (………………..)

3. The system which helps in regulating sugar level in the blood by (………………..)

4-A device that is used by diabetics to help them control the blood sugar levels with automatic injections of insulin(………………..)

5- A disease that is resulting from the disorder of secreting insulin hormone by pancreas(………………..)

4-Give a reason for

Diabetics must give themselves regular shots of insulin .

…………………………………………………………………

5-What happens if

Pancreas doesn't make its function correctly……………………………………

Concept 3

Energy as a System

Lesson 1

Activity 1	Explain to your child how a circuit is considered as a system
Activity 2	Discuss with your child the different ways to connect the components of electric circuit
Activity 3	Discuss with your child the similarities and differences between .gravity a magnetism

Lesson 2

Activity 4	Help your child do an experiment to determine what objects are attracted magnets and also how the distance between the magnet and .an object a the attraction between them

Lesson 3

Activity 5	Discuss with your child how a generator works.
Activity 6	Discuss with your child some information about electricity and magnetism
Activity 7	Explain to your child the components of an electric circuit

Lesson 4

Activity 8	Help your child do an experiment to know which materials are electric conductors and which are electric insulators

Lesson 5

Activity 9	Discuss with your child the difference between electric conductors and insulators
Activity 10	Explain to your child the difference between series and parallel circuits
Activity 11	Discuss with your child how a magnet can generate electricity

Lesson 6

Activity 12	Help your child to think like a scientist by answering a question about one of the main points of this concept then write his/her claim, evidence and the scientific explanation
Activity 13	Discuss with your child how to build a pacemaker

Lesson 1



Activity 1 electric circuits

Electrical poles *that support electric wires between cities and the wires inside walls are all examples of electric circuits*

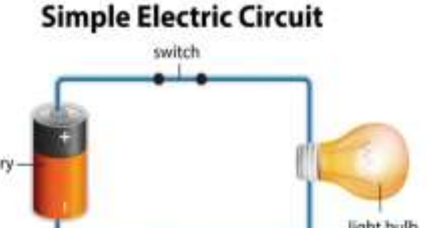
الأعمدة الكهربائية التي تدعم الأسلاك الكهربائية بين المدن والأسلاك داخل الجدران كلها أمثلة على الدوائر الكهربائية

So, every time you turn on a light switch or an electrical device, you use electric circuits

لذلك، في كل مرة تقوم فيها بتشغيل مفتاح الضوء أو جهاز كهربائي، فإنك تستخدم الدوائر الكهربائية.

How is a circuit considered as a system

كيف تعتبر الدائرة بمثابة دائرة كهربائية النظام

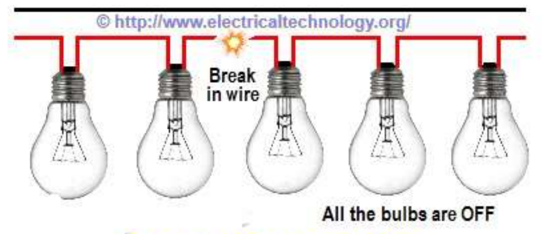


The electric circuit *is a path for electricity that consists of many components that work together as one system*

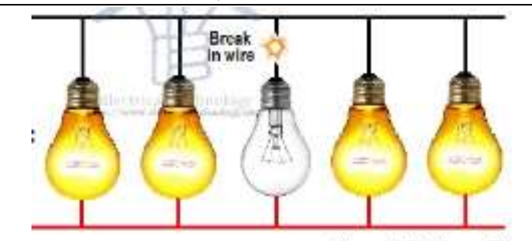
الدائرة الكهربائية هي مسار للكهرباء يتكون من عدة مكونات تعمل معاً كنظام واحد

Activity 2 Light Bulb Trouble مشكلة في المصباح الكهربائي

connected series way طريقة التوصيل على التوالي	connected parallel way طريقة التوصيل على التوازى
When a light bulb burns out, **all** *the other light bulbs are* **turned off** عندما يحترق المصباح الكهربائي، تنطفئ جميع المصابيح الكهربائية الأخرى	*When a light bulb burns out,* **all** *the other light bulbs* **still light** عندما يحترق المصباح الكهربائي، تظل جميع المصابيح الكهربائية الأخرى مضاءة



Series Connection



Parallel Connection

From the previous explanation, we can conclude that

There are different ways to connect the components of an electric circuit

• من من الشرح السابق، يمكننا أن نستنتج أن هناك طرق مختلفة لتوصيل مكونات الدائرة الكهربائية

Activity 3 Magnetism and Gravity المغناطيسية والجاذبية

Gravity and **magnetism** are forces that affect us every day.
الجاذبية والمغناطيسية قوتان تؤثران علينا كل يوم .

The two forces are different from the other forces because objects do not have to come into contact with one another to get affected by gravity or magnetism
القوتان مختلفتان عن القوى الأخرى لأنه ليس من الضروري أن تتلامس الأجسام مع بعضها البعض لتتأثر بالجاذبية أو المغناطيسية

Gravity at work الجاذبية في العمل

Gravity (gravitational force) is a force that affects everything which has mass
الجاذبية (قوة الجاذبية) هي القوة التي تؤثر على كل شيء له كتلة.

Earth has great mass compared to everything located on its surface, so all .objects **on** or near Earth's surface are **pulled toward its center**
تتمتع الأرض بكتلة كبيرة مقارنة بكل شيء موجود على سطحها، وبالتالي فإن جميع الأجسام الموجودة على الأرض أو بالقرب منها يتم سحب السطح نحو مركزه.

There are two factors that affect the force of **gravity** Mass Distance
هناك عاملان يؤثران على قوة الجاذبية هما المسافة الكتلة

As the distance between objects and the center of the Earth **increases,** the **gravitational force decreases**
كلما زادت المسافة بين الأجسام ومركز الأرض، انخفضت قوة الجاذبية

We cannot see gravity, but we can observe its effect on objects such as:
لا يمكننا رؤية الجاذبية، ولكن يمكننا ملاحظة تأثيرها على الأجسام مثل:



- Gravity **holds you** to the ground.
الجاذبية تحملك على الأرض.

When you throw a ball into the air, it will **stop** moving **upward** at a certain point and **fall back** to Earth this is due gravity
عندما ترمي كرة في الهواء، ستتوقف عن التحرك للأعلى عند نقطة معينة وتعود إلى الأرض، وهذا بسبب الجاذبية

:Magnetism at work

.**Magnets** are made of **iron** and other materials
المغناطيس مصنوع من الحديد ومواد أخرى.

A magnet has a force called "**magnetism**
للمغناطيس قوة تسمى المغناطيسية

Magnetism allows the magnet to attract certain **materials** without making direct contact
المغناطيسية تسمح للمغناطيس بجذب مواد معينة دون الاتصال المباشر.

Magnetism allows magnets to attract or **repel** other magnets •
المغناطيسية تسمح للمغناطيس بجذب أو تنافر المغناطيسات الأخرى.

Magnetic Field المجال المغناطيسية

Magnetism *of a magnet appears in an area around it known as* **magnetic field** "

تظهر مغناطيسية المغناطيس في منطقة حوله تعرف باسم المجال المغناطيسي

Magnetism *affects certain objects that are in its magnetic field*

Like gravity, *we* **cannot see the magnetic field,** *but we can only observe its effects.*

تؤثر المغناطيسية على أجسام معينة موجودة في مجالها المغناطيسي مثل الجاذبية، لا يمكننا رؤية المجال المغناطيسي، ولكن يمكننا فقط ملاحظة ذلك آثاره

The best way *to see the magnetic field is to allow a magnet attract some iron filings.*

إن أفضل طريقة لرؤية المجال المغناطيسي هي السماح للمغناطيس بجذب بعض برادة الحديد.

The pattern *that the Iron filings make near the magnet is the cutline of its magnetic field as shown in the picture.*



النمط الذي تصنعه برادة الحديد بالقرب من المغناطيس هو الخط المقطوع لمجاله المغناطيسي كما هو موضح في الصورة.

Similarities and differences between gravity and magnetism

أوجه التشابه والاختلاف بين الجاذبية والمغناطيسية:

Gravity الجاذبية	**Magnetism** المغناطيسية
Similarities أوجه التشابه	
Both of them are forces كلاهما قوى *It is not necessary for objects to come into contact with one another to get affected by gravity and magnetism* ليس من الضروري أن تتلامس الأجسام مع أحدهما آخر يتأثر بالجاذبية والمغناطيسية.	
الاختلافات **Differences**	
Gravity attracts *any object that has mass* الجاذبية تجذب أي جسم له كتلة **Gravity** *is always* **downward pulling** *force.*	**Magnetism** *attracts certain materials only* تجذب المغناطيسية مواد معينة فقط **Magnetism** *is considered as* تعتبر المغناطيسية على أنها - **A pulling force** *when it attracts objects or another magnet.* -قوة دفع عندما تصد مغناطيس آخر - **A pushing force** *when it repels another magnet* الجاذبية هي دائمًا قوة سحب للأسفل

Lesson 1

1- Choose the correct answer:

1. Gravity and magnetism are similar in that……….

a. they are repulsion forces only *b. they are attraction forces only*
c. they are forces that attract all objects *d. we cannot see them*

2-When we throw a ball upward it returns back to the Earth due to……….

a. gravity only *b. electricity and mass*
c. magnetism only *d. magnetism and electricity*

3-The …………of objects and the………. between them affect the gravity force

a. mass-color *b. distance-mass* *c. mass-distance* *d. volume-distance*

4-The force of Earth's gravity on plane (B) is that on plane (A)

a. greater than *b. smaller than*
c. equal to *d. double*

Airplane (B)
Airplane (A)
Earth

5- Magnets can be made of…………

a. copper *b. glass* *c. iron* *d. plastic*

6-The area around the magnet in which its force appears is known as

a. magnetic field *b. magnetism* *c. electric current* *d. gravity*

2-Put (√) or (X):

1- The force of gravity increases between objects when the distance between them increases ( )
2-Electric circuit is the path for electricity that consists of many components that work together as one system ( )
3-Electricity and magnetism can work together ( )
4-Earth attracts all objects on its surface due to its great mass ( )
5-During the falling down of an object towards Earth's surface, the gravity force increases ( )
6- Magnetism is an attraction or a repulsion force, while gravity is a repulsion force only ( )
7-The force of gravity appears when any object is thrown upward into the air as it will return back to its surface ( )
8-The magnet has a force called magnetism ( )
9- Small pieces of paper can be used to see the magnetic field of a magnet( )
10-All materials can be attracted to the magnet ( )

3-Write the scientific term of each of the following

1-The area around the magnet in which its magnetic force appears(…………….)
2. The force of Earth which attracts all objects on its surface to its center (……….)
3. The force that allows the magnet to attract some materials without making direct contact(……….……..)

4-Correct the underlined words

1-Magnetism is a pulling or pushing force, while gravity is a **pushing** *force only (……….……..)*
2-The magnet is surrounded by an area called **magnetism** *in which the magnetic force of a magnet appears (……….……..)*

*3-**Gravity** is the force by which a magnet attracts some materials(……….…..….)*
*4-**Electricity** is the force that affects all objects that has mass and attracts them towards Earth's center (………….…….)*
*5-The force of gravity is affected by two factors which are distance and **color** (………….…….)*

5- Give reasons for

1-The electric circuit is considered as a system

………………………………………………………………………………

2-When a ball is thrown into the air, it will stop moving upward and then falls down

………………………………………………………………………………

6-What happens to

1-The force of gravity if the mass of an object increases

………………………………………………………………………………

2-The force of gravity if the distance between the object and Earth's center increases

………………………………………………………………………………

7- Complete the following sentences using the words below

(iron filings-magnet-magnetic field - iron)

1-This tool is called ………….and it …………….. is made of
2-This tool is surrounded by an area called……………….
3-We can observe the force of this tool by using …………..which make pattern around it

Lesson 2

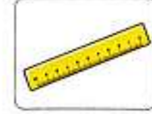
Activity 4 Does It Attract

what objects are attracted to magnets and also how the distance between the magnet and an object affect the attraction between them

اي الأجسام التي تنجذب إلى المغناطيس وأيضًا كيفية تأثير المسافة بين المغناطيس والجسم على الجذب بينهما



Magnet



Ruler

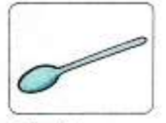


Iron nail



Aluminum foil





Plastic spoon



Copper wire



Steel paper clip

(steel is a special type of iron)



Steps *1-Put the magnet near each item to determine whether it material*

1-ضع المغناطيس بالقرب من كل قطعة لتحديد ما إذا كانت مادية أم لا

Observations *The iron nail and the steel paper clip are attracted to the magnet. The aluminum foil, the plastic spoon and the copper wire are not .attracted to t magnet*

الملاحظات: ينجذب المسمار الحديدي ومشبك الورق الفولاذي إلى المغناطيس. لا تنجذب رقائق الألومنيوم والملعقة البلاستيكية والسلك النحاسي إلى المغناطيس.



2-Put the Iron nail at the 0 cm of the ruler and put the magnet at the other end of the ruler

2- ضع المسمار الحديدي عند مسافة 0 سم من المسطرة ثم ضع المغناطيس في الطرف الآخر من المسطرة



3-Approach the magnet slowly closer to the iron nail

3 - اقترب من المغناطيس ببطء وأقرب إلى المسمار الحديدي

Observation ملاحظة

.The magnet attracts the iron nail at the distance of 6 cm

المغناطيس يجذب المسمار الحديدي على مسافة 6 سم.

Conclusions *1-Magnets attract some metals only, such as iron (steel), nickel and cobalt*

الاستنتاجات 1- يجذب المغناطيس بعض المعادن فقط مثل الحديد (الصلب) والنيكل والكوبالت

2-The magnetic objects are attracted to the magnet from far distance when these objects locate at the magnetic field of the magnet

2- تنجذب الأجسام المغناطيسية إلى المغناطيس من مسافة بعيدة عندما تقع هذه الأجسام عند المجال المغناطيسي للمغناطيس

Magnetic materials المواد المغناطيسية	**Non-magnetic materials** المواد غير المغناطيسية
They are materials that are attracted to the magnet هي مواد تنجذب إلى المغناطيس	*They are materials that are not attracted to the magnet* هي مواد لا تنجذب إلى المغناطيس
Examples *Iron, nickel and cobalt* الحديد والنيكل والكوبالت	**Examples** *Aluminum, plastic, copper, paper and wood* الألومنيوم والبلاستيك والنحاس والورق والخشب

Lesson 2

1- Choose the correct answer:

1. ………..is a magnetic material that is attracted to the magnet

a. Copper b. Iron c. Gold d. Wood

2-Some materials cannot be attracted to the magnet because they are…………

a. magnetic materials b. made of nickel, iron and cobalt

c. non-magnetic materials. d. located at the magnetic field of the magnet

3-When we put a piece of aluminum foil close to a magnet, it will………

a. be attracted to the magnet b. be a magnet

c. not attract to the magnet d. repel with the magnet

4-All the following materials are called magnetic materials, except……….

a. iron b. plastic c. nickel d. steel

5. Magnet affects certain objects like ……..when they locate in its magnetic field

a. wood and steel b. nickel and plastic c. iron and copper d. cobalt and steel

6-The area around the magnet in which magnetism can be observed is known as…..

a. magnetic materials b. magnetic field

c. non-magnetic materials d. iron filings

2-Put (√) or (X):

1-Magnets attract the non-magnetic materials such as iron, nickel and steel( )

2-Cobalt is an example of magnetic materials ( )

3-All magnets can be made of some materials like iron and glass ( )

4.The magnetic objects are attracted to the magnet at any distance from the magnet ( )

5-We can use the magnet to separate between some iron nails mixed with magnet( )

6-A piece of aluminum foil and a plastic spoon will be attracted to the magnet ( )

3-Write the scientific term of each of the following

1-The materials that are attracted to the magnet (…………………)

2-The materials that are not attracted to the magnet(…………………)

3. The area around the magnet at which the magnetic materials are attracted to the magnet (………………)

4-Give reasons for

1-Cobalt and nickel are considered as magnetic materials

…………………………………………………………………………………...

2-Wood and copper are not attracted to the magnet

…………………………………………………………………………………...

5-What happens if

1-A magnet is approached close to some iron nails mixed with small pieces of paper

…………………………………………………………………………………...

2-The magnetic objects are placed at a distance and do not locate at the magnetic field

…………………………………………………………………………………..

.

Lesson 3

Activity 5 Generating Electricity توليد الكهرباء

The generator is a device used in generating electricity
المولد هو جهاز يستخدم في توليد الكهرباء

Generator المولد

Structure It consists of: -Large magnets -Coiled wires
تركيبة يتكون من: -مغناطيس كبير -أسلاك ملفوفة

Function: It changes mechanical energy (kinetic energy) into electrical energy used in lighting houses and operating electrical devices
الوظيفة: يقوم بتحويل الطاقة الميكانيكية (الطاقة الحركية) إلى طاقة كهربائية تستخدم في إنارة المنازل وتشغيلها الأجهزة الكهربائية

How does a generator work كيف يعمل المولد

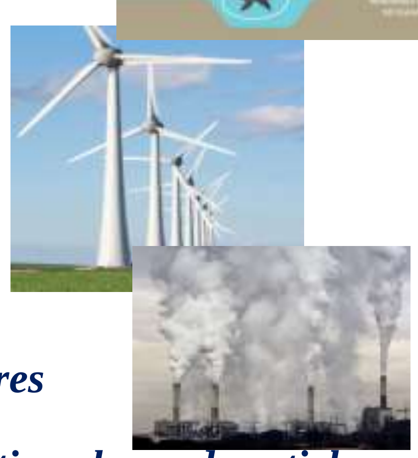
When large magnets spin at a high speed, the spinning magnets create electrical charges on the coiled wires, so electricity is produced
عندما تدور مغناطيسات كبيرة بسرعة عالية، تولد المغناطيسات الدوارة شحنات كهربائية على الأسلاك الملتفة، وبالتالي يتم إنتاج الكهرباء

There are different forces that can be used to make the **magnets** in the generator spin to **generate electricity,** such as
هناك قوى مختلفة يمكن استخدامها لجعل المغناطيسات الموجودة في المولد تدور لتوليد الكهرباء، مثل



1-Water in dams are used to **operate** water **turbines**, causing the magnets in the generator to spin
تستخدم المياه في السدود لتشغيل توربينات المياه، مما يؤدي إلى دوران المغناطيس في المولد

2-Winds are used to operate wind turbines, causing the magnets in the generator to spin
تستخدم الرياح لتشغيل توربينات الرياح، مما يؤدي إلى دوران المغناطيس في المولد



3-Sources of fuel such as **oil** and **coal** are used to make water boil **producing steam** which causes the magnet in the **generator to spin**
مصادر الوقود مثل يستخدم الزيت والفحم لغلي الماء وينتج البخار الذي يتسبب في دوران المغناطيس الموجود في المولد

Electric current The flow of electricity through wires
التيار الكهربائى تدفق الكهرباء من خلال الأسلاك

The electric current comes from the movement of tiny charged particles through conducting wires
التيار الكهربائى يأتي من حركة الجسيمات المشحونة الصغيرة من خلال إجراء الأسلاك

Magnetic field magnetic effect formed around the wire when an electric current flows through
يتكون التأثير المغناطيسي للمجال المغناطيسي حول السلك عندما يتدفق التيار الكهربائي

If a wire wrapped around a metal core, the **magnetic field** produced by the **flowing current** is strengthened, so the metal core **attracts the iron nails**

إذا كان سلكًا ملفوفًا حول قلب معدني ، يتم تعزيز المجال المغناطيسي الناتج عن التيار المتدفق ، لذلك يجذب اللب المعدني الأظافر الحديد كما في الصورة المعاكسة

From the previous explanation we can conclude that: Electricity and magnetism can work together

ومن الشرح السابق يمكننا أن نستنتج أن: الكهرباء والمغناطيسية يمكن أن تعملا معاً..

Activity 7 Components of a Circuit النشاط 7 مكونات الدائرة

Magnets, **generators** and **turbines** can be **used to generate electricity.**

يمكن استخدام المغناطيس والمولدات والتوربينات لتوليد الكهرباء.

Electricity: It is a form of energy from a flow of electric charges "electrons". moving along a path,

الكهرباء: هي شكل من أشكال الطاقة الناتجة عن تدفق الشحنات الكهربائية &;الإلكترونات&;. التحرك على طول مسار

Electric current: It is the flow of electric charges along a closed path.

التيار الكهربائي: هو تدفق الشحنات الكهربائية على طول مسار مغلق.

Electric circuit: It is a path for transmitting an electric current.

الدائرة الكهربائية: هي مسار لنقل التيار الكهربائي.

To make the electric current flow through a circuit, the loop (circuit) must be closed, this means that it must. begin and end in the same place without any breaks in the loop.

لجعل التيار الكهربائي يتدفق عبر الدائرة، يجب أن تكون الحلقة (الدائرة) مغلقة، وهذا يعني أنه يجب ذلك. تبدأ وتنتهي في نفس المكان دون أي فواصل في الحلقة.



The source of electricity, this source could be: Battery- Wall socket

مصدر للكهرباء، وهذا المصدر يمكن أن يكون: البطارية- فيشة الحائط



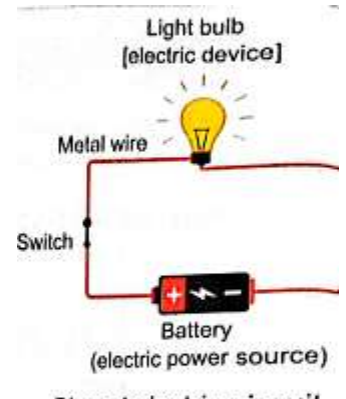
Wall socket is a source of electricity that transfers electric current from power lines connected to the building.

فيشة الحائط هو مصدر للكهرباء ينقل التيار الكهربائي من خطوط الكهرباء المتصلة بالمبنى.

• **Most electric circuits consist of many components that conduct electricity**,

- A metal wire. -An electric power source.
 A switch. -An electric device.

• تتكون معظم الدوائر الكهربائية من عدة مكونات موصلة للكهرباء،
- سلك معدني. - مصدر للطاقة الكهربائية. مفتاح. - جهاز كهربائي .



The switch: to open and close the electric circuit.

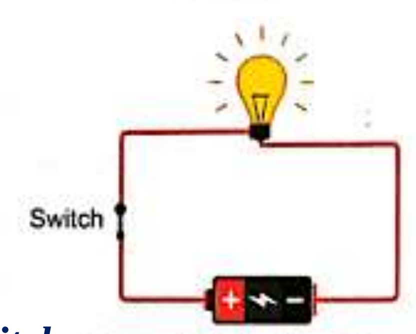
المفتاح: لفتح وإغلاق الدائرة الكهربائية.

A switch *can be manual such as a wall switch for lights, where: - When the switch is closed (turned on), it closes the circuit (closed electric circuit),*
المفتاح يمكن أن يكون يدوياً مثل مفتاح الجدار للأضواء، حيث: - عند إغلاق المفتاح (تشغيله)، فإنه يغلق الدائرة (دائرة كهربائية مغلقة)،
the electric *current flows through the circuit. Switch Light bulb (electric device] Motal wire Switch Battery (electric power source) Closed electric circuit*
فيتدفق التيار الكهربائي عبر الدائرة. مفتاح المصباح الكهربائي (جهاز كهربائي) سلك كهربائي مفتاح البطارية (مصدر الطاقة الكهربائية) دائرة كهربائية مغلقة

Switch

The switch is turned off

-When the switch is opened *(turned off), it opens the circuit (opened electric circuit), so the* **electric current doesn't flow through the circuit**.
- **عند فتح المفتاح (مطفأ)**، فإنه يفتح الدائرة (دائرة كهربائية مفتوحة)، وبالتالي لا يتدفق التيار الكهربائي عبر الدئرة



The switch is turned on

-When the switch is closed *(turned on), it closes the circuit (closed electric circuit), so the* **electric current flows through the circuit**..
- عند إغلاق المفتاح (تشغيله) فإنه يغلق الدائرة (دائرة كهربائية مغلقة) فيتدفق التيار الكهربائي عبر الدائرة..

A switch can be automatic such as the internal switch on a thermostat, which adjusts the temperature inside devices such as the refrigerator
يمكن أن يكون المفتاح أوتوماتيكياً مثل المفتاح الداخلي على منظم الحرارة الذي يضبط درجة الحرارة. درجة الحرارة داخل الأجهزة مثل الثلاجة.

Electric conductors and insulators: الموصلات الكهربائية والعوازل

Electric conductors الموصلات الكهربائية

هي مواد يتدفق *They are materials through which electric current (electrons) flows easily* من خلالها التيار الكهربائي (الإلكترونات) بسهولة

Electric conductors also known as " **good conductors of electricity**
الموصلات الكهربائية المعروفة أيضًا باسم "الموصلات الجيدة للكهرباء

Examples of good conductors of electricity:

-All metals such as copper and aluminum. -Water
أمثلة على الموصلات الجيدة للكهرباء: -جميع المعادن مثل النحاس والألمنيوم. -ماء

Electric insulators عوازل كهربائية

They are materials through which electric current (electrons) does not flow easily
إنها مواد لا يتدفق من خلالها التيار الكهربائي (الإلكترونات) بسهولة.

Electric insulators also known as " **bad conductors of electricity** *".*
العوازل الكهربائية المعروفة أيضًا باسم "الموصلات الردية التوصيل للكهرباء".

Examples of bad conductors of electricity.*Rubber - Plastic*
أمثلة على الموصلات السيئة للكهرباء -المطاط- بلاستيك

Current safety سلامة التيار

Most electric wires are **coated with rubber** *or* **plastic** *which are* **bad conductors of electricity**, *to* *protect people from electric shock*

معظم الأسلاك الكهربائية بالمطاط أو البلاستيك وهي موصلات سيئة للكهرباء ، لحماية الناس من الصدمة الكهربائية

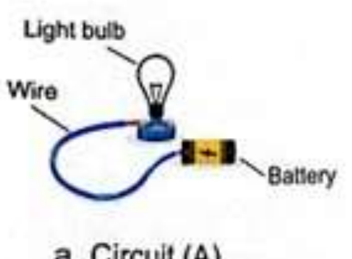


Touching non insulated *wire that an electric current flows through* **causes an electric shock** *and may cause* **death**, *because the* **human body** *contains a lot of water which is* **good conductor of electricity**

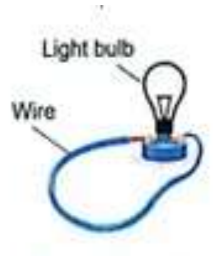
لمس الأسلاك غير المعزولة التي يتدفق التيار الكهربائي عبر صدمة كهربائية وقد يسبب الوفاة ، لأن جسم الإنسان يحتوي على الكثير من الماء الذي يعد موصلاً جيدًا للكهرباء.

Check your understanding

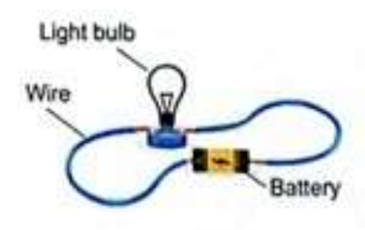
Examine the circuits in the diagrams, *then choose the circuit that will cause the light bulb to light up*



a. Circuit (A).



b. Circuit (B).



c. Circuit (C).

Lesson 3

1- Choose the correct answer:

1. Mechanical energy is converted into ……….energy in the generators

a. light b. sound c. electric d. thermal

2-Generators are used in ……………

a. building houses and heating water b. lighting houses and operating electric devices
c. producing sound energy d. generating thermal energy

3- The flow of electric charges along a closed path causes…………

a. electric circuit b. light energy c. electric current d. sound energy

4-…………..are used to spin the magnet in the generator to produce electricity

a. Water and winds b. Light and sound
c. Electricity and sound d. Sound and heat

5-Magnets are used in generators and…………. to generate……………

a. turbines- sound b. switches-sound c . lamps - heat d. turbines - electricity

6-The source of electricity in any electric circuit may be ……………….

a. a metal wire b. a switch c. a battery d. an electric lamp

7-The electric circuit contains …………which is responsible for opening and closing the circuit

a. a battery b. a switch c. a lamp d. a heater

8-When the switch is turned off, it……..the circuit, so the electric current……..

a. open-will flow through b. open-will not flow through
c. close - will pass through d. close-will not pass through

9-All the following materials are considered as electric conductors, except…….

a. copper b. water c. rubber d. iron

10-The internal switch on a …………can be used in the refrigerator to adjust its temperature

a. battery b. thermostat c. light bulb d. wall socket

11-Electric insulators like……… and………… do not allow electricity flow through them

a. copper and plastic b. rubber and iron c. rubber and plastic d. copper and iron

12-When electric current flows through your body it…….

a. causes an electric shock b. increasing your mass
c. decreasing the water level in your body d. does not affect your body

13- A magnetic field can be formed when electric current flows……………

a. a plastic tube b. a battery c. a metal core d. a glass core

2-Choose from column (B) what suits it in column (A)

(A)	(B)
1-Electricity	a. is a closed path through which electrons move
2-Electric conductors	b. are materials that electric charges flow through
3-Electric circuit	c. is a source of electric charges in the circuit
4-Electric insulators	d. is a form of energy
5-Battery	e. is used to open and close the circuit
	f. are maternal through which electrons can't flow

1-………..2-………….. 3-…………. 4-……………… 5-……………

3-Put (√) or (X):

1-Electricity can be produced from magnetism ( )
2. Water in dams are used to operate wind turbines ( )
3-To make electric current flow through a circuit, all components must be connected to each other ( )
4-The electric circuit must contain a source of electricity such as the switch( )
5-The thermostat in a refrigerator contains an automatic switch( )
6-All materials allow electric current to flow through them ( )
7-Copper, aluminum and rubber are electric conductors ( )
8-When the electric circuit is opened, the electric current doesn't flow through it ( )
9-All metals are electric insulators ( )
10-Electric wire can be made of copper and covered with plastic or rubber ( )

4-Write the scientific term of each of the following

1-The device which changes mechanical energy into electrical (…..………….)
2-A form of energy produced from generators and turbines (……….………)
3-The flow of electrons through an electric wire (…………………)
4-A closed loop through which electric current can flow (……..…………)
5-A tool in the circuit which is used to open and close the circuit(……………)
6-It is used to adjust the temperature inside some devices such as the refrigerator (……………)
7-The materials that the electric charges can flow through(…………………)
8-They are materials that donot allow electric current to flow through (….….)

5-Give reasons for

1-Electric generators have great importance in our life

…… …… …… …… …… …… …… …… …… …… …… …… …… ……

2-The electric circuit must contain a battery

…… …… …… …… …… …… …… …… …… …… …… …… …… ……

3-All metals are considered as electric conductors

…… …… …… …… …… …… …… …… …… …… …… …… …… ……

4-Most electric wires are covered with rubber or plastic

…… …… …… …… …… …… …… …… …… …… …… …… …… ……

6-What happens if

1-Large magnets spin at a high speed, around coiled wires

…… …… …… …… …… …… …… …… …… …… …… …… …… ……

2-The electric circuit doesn't contain switch

…… …… …… …… …… …… …… …… …… …… …… …… …… ……

Lesson 4

Activity 8 Conductors and Insulators الموصلات والعوازل

Materials are two types *electric conductors and which are electric insulators*

المواد نوعان موصلات للكهرباء وهي عوازل كهربائية

Tools الأدوات


Battery

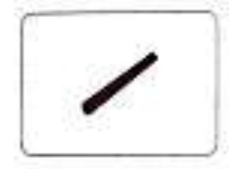

Small LED lamp

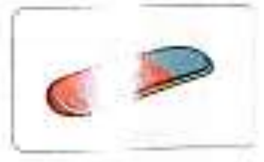

Two wires with non insulated ends


Alum um foil


Electrical tape


Coin

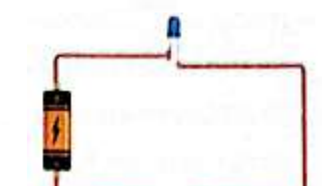

Small piece of wood


Rubbe (eraser)


Piece of cloth


Paper clip

Steps الخطوات



1-Use the wires, the small LED lamp *and the* **battery** *to create an electric circuit*

1-استخدم الأسلاك ومصباح LED الصغير والبطارية لإنشاء دائرة كهربائية

2-Insert the coin *in the circuit as shown to* **test** *if it* **conducts** *electricity* **or not**

2- أدخل العملة المعدنية في الدائرة كما هو موضح لاختبار هل هي موصلة للكهرباء أم لا

3-Insert the rubber *(eraser) in the circuit as shown to .***test** *if it* **conducts** *electricity* **or not**

3- أدخل الممحاة المطاطية في الدائرة كما هو موضح لاختبار إذا كانت موصلة للكهرباء أم لا.



4-Repeat the previous steps *to test all materials you have*

4- كرر الخطوات السابقة اختبر جميع المواد التي لديك

ملاحظات Observations

The lamp lights when *the coin, the aluminum foil or the paper clip are inserted into the circuit*

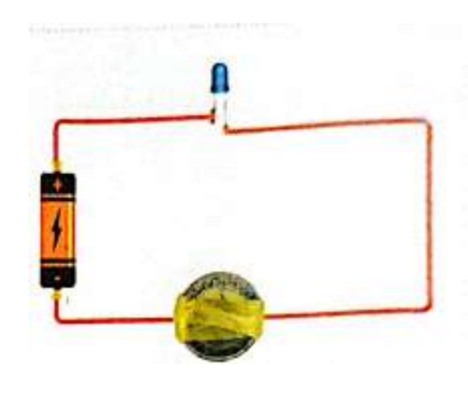
يضيء المصباح عند إدخال العملة المعدنية أو ورق الألمنيوم أو مشبك الورق في الدائرة.

The lamp doesn't light *when the rubber (eraser), the small piece of wood or the piece of cloth are inserted into the circuit*

لا يضيء المصباح عند إدخال المطاط (الممحاة) أو قطعة الخشب الصغيرة أو قطعة القماش في الدائرة

Conclusions

Electric conductors الموصلات الكهربائية	Electric insulators العوازل الكهربائية
Materials made of metal (such as the coin, the aluminum foil and the paper clip) المواد المصنوعة من المعدن (مثل العملة المعدنية ورقائق الألومنيوم ومشبك الورق)	*materials (such as the rubber, the small piece of wood and the piece of cloth)* المواد (المطاط وقطعة الخشب الصغيرة وقطعة القماش)
conduct enough electricity for the lamp to light توصيل ما يكفي من الكهرباء حتى يضيء المصباح	*don't conduct electricity for the lamp to light* لا توصل الكهرباء للمصباح الضوء



If you wrap one of the previous electric conductors *(such as the coin) with the* **electrical tape which is made of plastic** *and insert it again in the circuit, the* **lamp** *in the circuit will* **not light because the electric current cannot flow through the plastic.**

- إذا قمت بلف أحد الموصلات الكهربائية السابقة (مثل العملة المعدنية) بالشريط الكهربائي المصنوع من البلاستيك وأدخلته مرة أخرى في الدائرة فإن المصباح الموجود في الدائرة لن يضيء لأن التيار الكهربائي لا يمكن أن يمر عبر البلاستيك .

Electric wires *are* **wrapped in plastic** *which is an insulator to prevent electricity from moving from the metal wire into our hands*

- الأسلاك الكهربائية مغلفة بالبلاستيك و هو عازل يمنع انتقال الكهرباء من السلك المعدني إلى أيدينا

Check your understanding

▸ **Classify the following materials into electric conductors and electric insulators**

(Iron nail - Plastic spoon - Rubber - Metallic spoon - Piece of wood -Metallic key)

Electric conductors	Electric insulators
....	....

Lesson 4

1- Choose the correct answer:

1. ………….is a material that cannot allow electric current to flow through

a. Iron b. Copper c. Plastic d. Cobalt

2-The electric wires can be made of………..or…………….

a. wood-plastic b. rubber-wood

c. aluminum-copper d. plastic-rubber

3-The electric wires are covered with………. as it is…………

a. copper-good conductor of electricity b. plastic-bad conductor of electricity

c. iron-strong material d. plastic-electric conductor

4-All the following materials are electric insulators, except ………….

a. rubber b. plastic. c. wood d. steel

5-Which of the following is a poor conductor of electricity and is used to coat wires…..

a. A conductor. b. Non insulator c. A switch. d. A battery.

6. Metallic materials are considered electric ………….,while glass and rubber are considered electric…………….

a. insulators-conductors b. conductors-insulators

c. circuits-conductors d. insulators-energy

2-Put (√) or (X):

1-Wood and plastic are electric insulators. ( )

2 Electric current can flow through all materials ( )

3-Electric wires are covered with plastic to protect us from electric shock ( )

4-Electric insulators only allow electric current to pass through them. ( )

5. Copper, rubber and iron are electric conductors ( )

6-Materials made of metals can conduct electricity ( )

7. If your hand touches an insulated wire you will be shocked by electricity( )

8-Glass is a good conductor of electricity, while water is a bad conductor of electricity

3- Give reasons for

1-Electric wires are made of copper

……………………………………………………………..

2-Electric wires are wrapped in plastic

……………………………………………………………..

4-What happens if

1-Rubber is used in making electric wires instead of copper

……………………………………………………………..

2-A person touches non insulated electric wire through which an electric passes

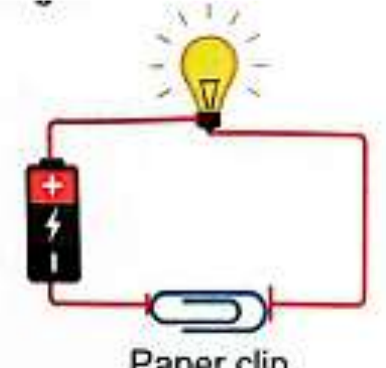
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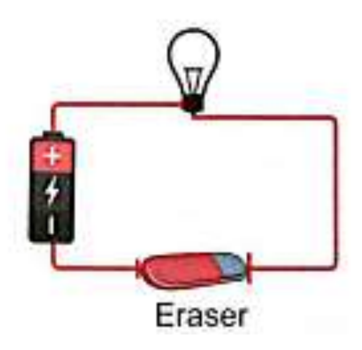
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Lesson 5

Activity 9 Construct an Electric Circuit بناء دائرة كهربائية

Electric conductors الموصلات الكهربائية	Electric insulators العوازل الكهربائية
They are materials that **allow electrons to flow through them easily** وهي مواد تسمح للإلكترونات بالتدفق عبرها بسهولة	*They are materials that* **do not allow electrons to flow through them easily** (وهي مواد لا تسمح للإلكترونات بالتدفق عبرها بسهولة)
If a conductor *(a paper clip) is placed in a circuit with a* **battery** *and a* **light bulb, electricity will flow** *and the light bulb* **will light** إذا تم وضع موصل (مشبك ورق) في دائرة بها بطارية ومصباح كهربائي، فسوف تتدفق الكهرباء ويضيء المصباح الكهربائي	**If an insulator** *(an eraser) is placed in a circuit with a* **battery and a light bulb, electricity will not flow and the light bulb will not light** إذا تم وضع عازل (ممحاة) في دائرة بها بطارية ومصباح كهربائي. لن تتدفق الكهرباء ولن يضيء المصباح الكهربائي





Importance of insulators أهمية العوازل

Insulators **stop the flow of electricity**, *so* **they keep you safe from** *getting* **shocked** *by the electric current*

تعمل العوازل على إيقاف تدفق الكهرباء، لذا فهي تحميك من التعرض لصدمة من التيار الكهربائي

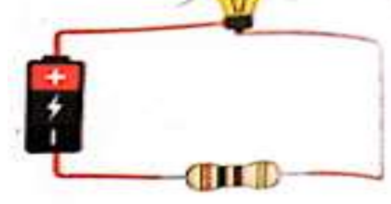
Plastic is an insulator *that coats wires and plugs to keep you safe when you are handling them*

البلاستيك عبارة عن عازل يغطي الأسلاك والمقابس للحفاظ على سلامتك عند التعامل معها

Resistors المقاومات

They are components of an electric circuit that limit the flow of electric current

هي مكونات الدائرة الكهربائية التي تحد من تدفق التيار الكهربائي :



Resistors *are used to slow the flow of electrons through an electric circuit to avoid the damage of the components of an electric circuit*

تستخدم المقاومات لإبطاء تدفق الإلكترونات عبر الدائرة الكهربائية لتجنب تلف مكونات الدائرة الكهربائية

Resistors can be found in المقاومات توجد في

Toasters *Electric stoves* *Microwaves*

محامص الخبز، الأفران الكهربائية، أجهزة الميكروويف

Activity 10 Electric Circuits: Series versus Parallel Circuits

نشاط 10 الدوائر الكهربائية: الدوائر المتوالية مقابل الدوائر المتوازية

The electric circuits can be connected in two different ways.

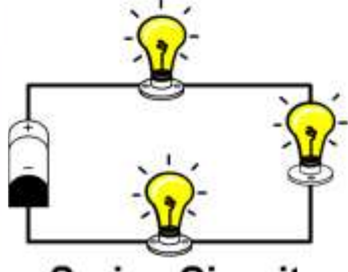
يمكن توصيل الدوائر الكهربائية بطريقتين مختلفتين.

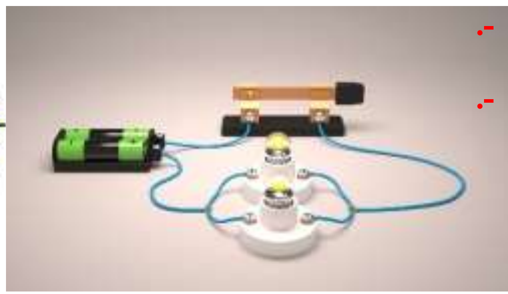
These circuits are called (Series circuits- Parallel circuits)

وتسمى هذه الدوائر (دوائر التوالي- الدوائر التوازى)

Series circuit دوائر التوالي	Parallel circuit الدوائر التوازى
-all the components must be connected in a single loop *(one path)* يجب توصيل جميع المكونات في حلقة واحدة (مسار واحد). -can only flow along one path *from the energy source through the circuit and back to the energy source* يمكن أن يتدفق فقط على طول مسار واحد من مصدر الطاقة عبر الدائرة ويعود إلى مصدر الطاقة we can operate two light bulbs on the same circuit. *but if one light bulb blows out or is disconnected, the other one will not work* يمكننا تشغيل لمبتين كهربائيتين على نفس الدائرة. ولكن إذا انفجر أحد المصباحين الكهربائيين أو تم فصله، فلن يعمل المصباح الآخر	-The light bulbs are connected in two or more different branches *of the circuit* يتم توصيل المصابيح الكهربائية في فرعين مختلفين أو أكثر من الدائرة ، -can flow along different parallel branches *(more than one path) from the energy source through the circuit and back to the energy source* يمكن أن يتدفق على طول مختلف فروع متوازية (أكثر من مسار) من مصدر الطاقة عبر الدائرة والعودة إلى مصدر الطاقة we can turn off or remove one light bulb *while the other light bulb will remain it* يمكننا إطفاء أو إزالة لمبة واحدة بينما تبقى المصباح الآخر كما هو







Advantage to use parallel circuits ميزة استخدام الدوائر المتوازية

Parallel circuits are found in houses, *so we can operate the* blender, *the* refrigerator *and the* television *all at the* same time *but, if we turn off one of the previous devices, the others will continue to work because they operate on a parallel circuit*

الدوائر المتوازية موجودة في المنازل، لذا يمكننا تشغيل الخلاط والثلاجة والتلفزيون في نفس الوقت، ولكن إذا قمنا بإيقاف تشغيل أحد الأجهزة السابقة، فستستمر الأجهزة الأخرى في العمل لأنها تعمل على دائرة متوازية

Towns and cities are part of an electric circuit, where

تعد البلدان والمدن جزءًا من دائرة كهربائية، حيث

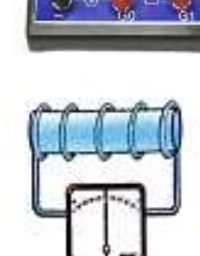
The energy source is the power plant *which has* generators *that* push out electricity.

مصدر الطاقة هو محطة توليد الكهرباء التي تحتوي على مولدات تعمل على إخراج الكهرباء.

Then electricity travels along conductors called power lines into all kinds of electrical devices in houses, businesses and factories.

ثم تنتقل الكهرباء عبر موصلات تسمى خطوط الكهرباء إلى جميع أنواع الأجهزة الكهربائية في المنازل والشركات والمصانع

Activity 11 Magnetism and Electricity المغناطيسية والكهرباء



How a magnet can generate electricity

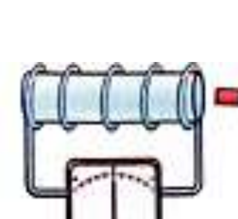
كيف يمكن للمغناطيس توليد الكهرباء

Galvanometer *It is a device used to detect the flow of small electric currents*

الجلفانومتر هو جهاز يستخدم للكشف عن تدفق التيارات الكهربائية الصغيرة

A scientist made an experiment, where-

- قام أحد العلماء بتجربة، حيث

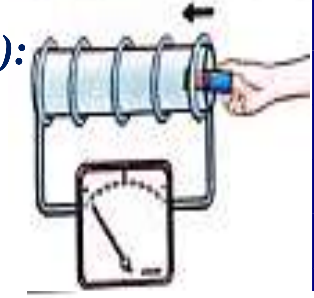


-He tightly coiled *a wire around a* **hollow cylinder** *and he connected this coil to a galvanometer*

- قام بلف سلك بإحكام حول أسطوانة مجوفة وقام بتوصيل هذا الملف بالجلفانومتر

- **Then he placed a magnetic** *bar in different distances from the coil and he noticed that*

- ثم وضع قضيبًا مغناطيسيًا على مسافات مختلفة من الملف ولاحظ أنه



When the magnet was placed at rest away from the coil: **The needle of the galvanometer did not move**, *which indicates that there was no electric current flow*

عندما تم وضع المغناطيس في حالة سكون بعيدًا عن الملف: تحركت إبرة الجلفانومتر لا يتحرك، مما يدل على عدم وجود تدفق للتيار الكهربائي.

When the magnet was moved toward *and* **into** *the* **coil** *(cylinder)*:
The needle of the galvanometer moved to one side

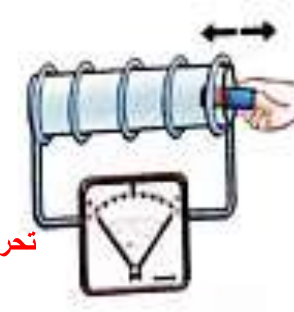
عندما تم تحريك المغناطيس نحو وداخل الملف (الأسطوانة): تحركت إبرة الجلفانومتر إلى جانب واحد،

which indicates *that there was an* **electric current flow**.

مما يشير إلى وجود تيار كهربائي تدفق التيار.

When the magnet was moved rapidly back *and* **forth** *Inside the coil*

عندما تم تحريك المغناطيس بسرعة ذهابًا وإيابًا داخل الملف



The needle of the galvanometer also moved rapidly *so*, **he concluded that** *when* **the movement of the magnet increases**, *the generated electric current increases*

تحركت إبرة الجلفانومتر أيضًا بسرعة لذلك استنتج أنه عندما تزيد حركة المغناطيس، يزداد التيار الكهربائي المتولد

Note ملاحظة

if the number of loops in the coil increases, *the movement of the needle of the* **galvanometer will increase** *which indicates that the* **amount of generated electric current** *(voltage)* **will increase**.

إذا زاد عدد الحلقات في الملف فإن حركة إبرة الجلفانومتر ستزداد مما يدل على أن كمية التيار الكهربائي المتولد (الجهد) ستزداد

There are relation *between magnetism and electricity, which is used in*

من التجربة السابقة عرفنا العلاقة بين المغناطيسية و الكهرباء، والتي تستخدم في

Electric generator المولدات الكهربائية *Electric motor* المحركات الكهربائية
المحولات الكهربائية *Electric transformer*

Lesson 5

1- Choose the correct answer:

1. Electricity can flow through………

a. electric conductors b. electric Insulators c. wooden bar d. an eraser

2- …………are used to stop the flow of electricity

a. Resistors b. Electric conductors c. Electric insulators d. Galvanometers

3-……….can be found in toasters and……….

a. Microwaves - electric stoves b. Resistors - electric stoves
c. Electric stove- resistors d. Microwaves-electric resistors

4-In the. …………circuit, all components are connected in one loop

a. open parallel b. closed parallel c. open series d. closed series

5-In a……… the electric current can flow through different branches

a. series circuit b. parallel circuit c. resistor d. microwave

6-………is used to slow the flow of an electric current in the electric circuit

a. A battery b. A switch c. A resistor d. A lamp

7-Scientists use a……… to detect the flow of small electric currents

a. generator b. galvanometer c. battery d. switch

8-Resistors are found in all of the following devices, except ……

a. toasters b. microwaves c. electric stoves d. batteries

9-All of the following are from the properties of parallel electric circuits except

a. all components are connected together
b. electric current pass in one loop only.
c. we can turn off or remove one light bulb without affecting the other light bulbs
d. electric current flow through different branches

10-The electric wires are made of ………..that conduct electricity

a. plastic and glass b. rubber and aluminum
c. copper and aluminum d. wood and plastic

2-Put (√) or (X):

1- In the series circuits, the electric current can flow in different branches ( )
2-The materials that are used to connect the components of the electric circuit called electric insulators ( )
3-Resistors are used to slow the flow of electrons through an electric ( )
4. The electric insulators keep us safe from getting shocked by the electric current ( )
5-Towns and cities are parts of an electric circuit. ( )
6. The electric devices in houses are connected in series circuits ( )
7-The device that is used to detect the small electric current intensity is called galvanometer ( )
8-When a magnet is placed at rest away from copper coil, an electric current will be produced ( )
9- The needle of a galvanometer moves on moving a magnet in and out of a copper coil ( )
10-By increasing the number of loops in any coil and moving a magnet inside it rapidly, the amount of generated electric current will decrease ( )
11-There is no relation between magnetism and electricity ( )

3-Write the scientific term of each of the following

1-One of the components of an electric circuit that is used to limit the flow of electricity through the circuit (………………..)

2-The type of electric circuits in which all components must be connected in one loop (………………..)

3-The type of electric circuits that are found in houses and help in operating many devices at the same time (………………..)

4-A device can be used to detect the flow of small electric currents(……………..)

5-Materials that allow electrons to flow through them easily(………………..)

6. Materials that don't allow electrons to flow through them easily(……………..)

4-Give reasons for

1-Some electric circuits contain resistors

…………………………………………………………………………………

2-In the parallel circuit, we can turn off or remove one light bulb while the other light bulb will remain lit

…………………………………………………………………………………

3-When a magnet is moved rapidly back and forth inside a coil, the needle of the galvanometer connected to the coil moves rapidly

…………………………………………………………………………………

5-What happens if

1-A large amount of electricity passes through an electric circuit has an electric device, and this circuit doesn't contain a resistor

…………………………………………………………………………………

2-Electric circuits in houses are connected in series

…………………………………………………………………………………

3-A magnet moved rapidly inside a coil of wire in a circuit containing galvanometer

…………………………………………………………………………………

Lesson 6



Pacemaker جهاز تنظيم ضربات القلب

The heart is a muscle that beats consistently for the duration of our live

القلب عبارة عن عضلة تنبض باستمرار طوال حياتنا

The heart has a natural pacemaker which creates electrical currents that it send out through the heart, causing the heart to contract.

يحتوي القلب على جهاز تنظيم ضربات القلب الطبيعي الذي يولد تيارات كهربائية يرسلها عبر القلب، مما يؤدي إلى انقباض القلب

When the natural pacemaker starts to fail, sometimes we need an artificial pacemaker to keep the heart beating correctly

عندما يبدأ جهاز تنظيم ضربات القلب الطبيعي بالفشل، نحتاج أحيانًا إلى جهاز تنظيم ضربات القلب الاصطناعي للحفاظ على نبض القلب بشكل صحيح

Artificial pacemaker جهاز تنظيم ضربات القلب الاصطناعي

It is a device that operates with a battery وهو جهاز يعمل بالبطارية

It is inserted into the chest and stimulates the heart muscle to beat at regular intervals for patients who have a slow or irregular heartbeats.

يتم إدخاله في الصدر ويحفز عضلة القلب على النبض على فترات منتظمة للمرضى الذين يعانون من بطء أو عدم انتظام ضربات القلب.

Artificial pacemakers have been in use for over 60 years

* تم استخدام أجهزة تنظيم ضربات القلب الاصطناعية منذ أكثر من **60** عامًا

How to build a pacemaker *you need*

كيفية بناء جهاز تنظيم ضربات القلب الذي تحتاجه

A battery -A motherboard -An insulated electric wire

بطارية - اللوحة الأم - سلك كهربائي معزول

The future of pacemakers مستقبل أجهزة تنظيم ضربات القلب

* *The artificial pacemaker has a built-in antenna to send information sys (doctors), so they know how the heart is behaving*

* يحتوي جهاز تنظيم ضربات القلب الاصطناعي على هوائي مدمج لإرسال نظام المعلومات (الأطباء)، حتى يتمكنوا من معرفة كيف يتصرف القلب

Pacemakers are getting more advanced by the year and becoming smaller too

تتقدم أجهزة تنظيم ضربات القلب بمرور العام وتصبح أصغر من مجرد خدمة بسيطة.

* *Today, doctors can place a tiny, effective pacemaker well within the heart with a simple surgery.*

* اليوم، يستطيع الأطباء وضع جهاز تنظيم ضربات القلب الصغير والفعال داخل القلب بعملية جراحية بسيطة.

Lesson 6

1- Choose the correct answer:

1. The …………is a muscle that beats inside the human body to push the blood to body parts

a. stomach b. brain c. heart d. hair

2-The normal heart has a ……….heart to which creates electrical current that cause the heart to ……………..

a. natural pacemaker - stop b. natural pacemaker contract

c. artificial pacemaker – stop d. artificial pacemaker - contract

3-The artificial pacemaker is inserted into the ………………of the human body

a. brain b. chest c. legs d. hands

4-The artificial pacemaker contains a ………… to send information to physicians, so they know the condition of the …………….

a. battery-lung b. motherboard - brain

c. built-in antenna - heart d. battery- heart

2- Put (√) or (x

1-Sometimes electricity can be used to help our body parts to move ( )

2-The heart is important in our body as it helps in food digestion ( )

3-The natural pacemaker inside our heart creates electrical currents to make it contracts( )

4-Scientists use an artificial pacemaker to stimulate the heart muscle to beat regularly ( )

5-The artificial pacemaker should contain a battery to do its function ( )

3-Write the scientific term of each of the following

1-A muscle in the human body that beat regularly to push the blood inside the body (………………)

2-A device inserted into the chest to stimulate the heart to beat regularly(………………)

4-Complete the following sentences

1-The heart has a natural …………..which causing the heart to contract

2-The artificial pacemaker has a built-in.................... to send information to physicians.

3-To build a pacemaker, ……………an insulated electric wire with a coating and …………….are needed.

5-Give reasons for

1-Scientists provide the new artificial pacemaker by a built-in antenna

………………………………………………………………………………...

2-The heart has a natural pacemaker

………………………………………………………………………………...

6-What happens if

.A patient has a slow or irregular heartbeats

Concept 2.1

THEME TWO: MATTER AND ENERGY

Lesson 1

Activity 1	*Explain to your child how are changes in thermal energy, heat transfer temperature related to particles in matter*
Activity 2	*Discuss with your child how we can make glassware by using molten very high temperatures*
Activity 3	*Discuss with your child how molecules move in different states of matter the relationship between their movement and thermal energy*

Lesson 2

Activity 4	*Help your child to know the relationship between thermal .energy, kinetic energy and temperature*
Activity 5	*Discuss with your child how matter change from state to another when the thermal energy changes*

Lesson 3

Activity 6	*Help your child to do an experiment that shows how the temperature the kinetic energy and the motion of molecules of matter*

Lesson 4

Activity 7	*Help your child to know that the change of state of matter depends o thermal energy and the movement of the molecules of matter*
Activity 8	*Discuss with your child some examples of the contraction and expansion of some matter*

Lesson 5

Activity 9	*Help your child to make a model of a thermometer*
Activity 10	*Discuss with your child what happens when thermal energy is adder a substance*
Activity 11	*Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her claim, evidence and the scientific explanation*
Activity 12	*Explain to your child the techniques that engineers use to make sure that bridge, railroad stay safe over time*

Lesson 1

Activity 2 Glassblowing نشاط 2 نفخ الزجاج

Glassblowing نفخ الزجاج

Manufacturing of glass depends on **changing the glass from one state to another**

يعتمد تصنيع الزجاج على تغيير الزجاج من حالة إلى أخرى

When the glass *(solid state) is* **heated at very high temperatures**, *it changes into* **molten glass** *(liquid state)*

عندما يتم تسخين الزجاج (الحالة الصلبة) عند درجات حرارة عالية جدًا، فإنه يتحول إلى زجاج منصهر (الحالة السائلة)

Glassblowing *is a process to* **form different shapes of glassware by using a hollow tube contains molten glass** *at one end of its ends, where*

نفخ الزجاج عبارة عن عملية تشكيل أشكال مختلفة من الأواني الزجاجية باستخدام أنبوب مجوف يحتوي على الزجاج المنصهر في أحد طرفيه، حيث



The molten glass *could be blown by a person from the open end of the hollow tube and he could make different shapes of molten glass*

يمكن للإنسان نفخ الزجاج المنصهر من الطرف المفتوح للأنبوب المجوف ويمكنه صنع أشكال مختلفة من الزجاج المنصهر.

Then, the molten glass is cooled forming different shapes of glassware

ثم يتم تبريد الزجاج المنصهر لتشكيل أشكال مختلفة من الأواني الزجاجية

Activity 3

What Do you Already know About Thermal Energy in States of Matter

ماذا تعرف عن الطاقة الحرارية في حالات المادة

Everything *around us is made of matter* كل شيء حولنا مصنوع من المادة

Matter *can change from one state into another* يمكن للمادة أن تتغير من حالة إلى أخرى

Al matter *is made of* **particles** *called* **atoms** *and* **molecules**

المادة مكونة من جزيئات تسمى ذرات وجزيئات

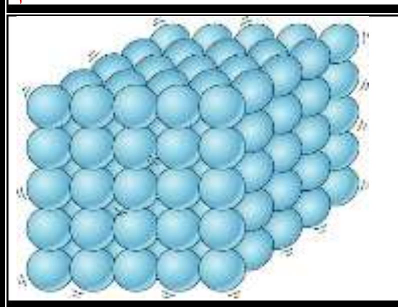
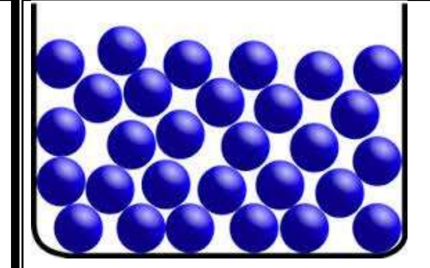
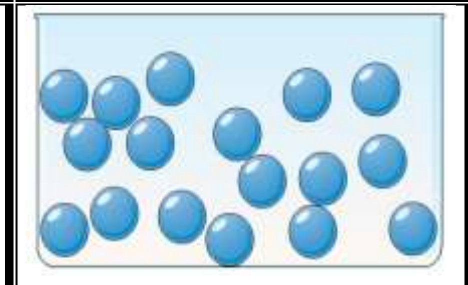
Atoms *the smallest building unit of matter* الذرات أصغر وحدة بناء جزيء المادة

Molecule *a group of atoms bound together* الجزيء مجموعة من الذرات مرتبطة ببعضها البعض

Solids المواد الصلبة	**Liquids** المواد السائلة	**Gases** المواد الغازية
Its Particles move **slowly**, تتحرك جزيئاته ببطء *they have the* **least thermal energy** لديهم طاقة حرارية أقل *Example: Ice cubes* مثال:مكعبات الثلج	*Its Particles move* **faster**, تتحرك جزيئاته بشكل أسرع، *they have* **moderate thermal energy** لديها طاقة حرارية معتدلة *Example: Water* مثال: الماء	*Its Particles move* **very fast**, تتحرك جزيئاتها بسرعة كبيرة، *they have the* **most thermal energy** لديها أكبر طاقة حرارية *Example: steam* مثال: البخار

Some properties of different states of matter

بعض خصائص حالات المادة المختلفة

Solids المواد الصلبة	Liquids المواد السائلة	Gases المواد الغازية
Shape and volume *They are substances that save fixed shape and volume* الشكل والحجم هي مواد تحافظ على شكل ثابت و الحجم	**Shape and volume** *They are substances that have fixed volume and variable shape* الشكل والحجم هي مواد لها حجم ثابت وشكل متغير	**Shape and volume:** *They are substances that have variable shape and volume* الشكل والحجم هي مواد لها حجم وشكل متغير
		
Molecules *Their molecules are held together tightly in their positions* الجزيئات: جزيئاتها متماسكة بإحكام في مواضعها **Molecules movement** *Their molecules vibrate around their places* حركة الجزيئات تهتز جزيئاتها حول أماكنها	**Molecules** *Their molecules are held together more loosely than molecules of solids* الجزيئات: ـ تتماسك جزيئاتها معًا بشكل أكثر مرونة من جزيئات المواد الصلبة **Molecules movement** *Their molecules move faster than solids and slide over each other* حركة الجزيئات تتحرك جزيئاتها بشكل أسرع من المواد الصلبة وتنزلق فوق بعضها البعض	**Molecules** *Their molecules are not held together as they are much more loosely than molecules of .liquids* الجزيئات: ـ ـ لا تتماسك جزيئاتها معًا لأنها أكثر رخاوة من غيرها **Molecules movement** *Their molecules move independently in all directions* حركة الجزيئات تتحرك جزيئاتهم بشكل مستقل في جميع الاتجاهات

Thermal energy in states of matter الطاقة الحرارية في حالات المادة

All matter contains thermal energy

كل المادة تحتوي على طاقة حرارية

الطاقة الحرارية Thermal energy

It is the movement of particles of an object هي حركة جزيئات الجسم

The transfer of thermal energy is called heat يسمى نقل الطاقة الحرارية بالحرارة

How much thermal energy in different states of matter

كم مقدار الطاقة الحرارية في حالات المادة المختلفة

Exercise on Lesson 1

1- Choose the correct answer:

1. The molecule is composed of very small particles called ………

a. cells c. mixture b. atoms d. compound

2-All of these substances are solids, except

a. pen b. balloon c. soup d. snow

3-Both ……….and ………….are examples of liquid matter

a. water-milk b. water-wood c. water-copper d. oil-paper

4-Particles of all the following substances have a lot of energy, except

a. oxygen b. carbon dioxide c. water vapor d. glass

5-Thermal energy affects……….and …………. of a matter

a. temperature-state b. temperature-color c. color-taste d. color-smell

6-The………. energy is related to the motion of particles of a matter

a. chemical b. potential c. light d. thermal

7-On boiling water inside a kettle…………

a. water particles will move faster b. water particles will move slower

c. thermal energy of water will decrease d. thermal energy of water will not change

2-Choose from column (B) and (C) what suits them in column (A)

(A) Type of matter	(B) Example	(C) Its particles have.... energy
1-Solid	a. steam	A. high thermal
2-Liquid	b. water	B. no thermal
3-Gas	c. sound	C. low thermal
	d. ice	D. moderate thermal

1-…… → …….2- ……… ……… → 3- ……… ……… →

3-Put (√) or (X)

1-Matter can be changed from one state lo another ( )

2-Glass can be melt at very low temperatures ( )

3-Almost all matter contain thermal energy ( )

4-The movement of particles within an object is used to describe the thermal energy ( )

5-Substances in gas form have the least thermal energy( )

6-All forms of matter are made of particles that are in a state of motion ( )

7. Gases have variable shape and volume ( )

4-Write the scientific term of each of the following

1-It is the smallest building unit of matter (………………)

2-It is a group of atoms bound together (………………)

3-The state of matter at which its particles has the most thermal energy(………)

4-The state of matter that has fixed volume and shape (………………)

5-The process of shaping a mass of molten glass by blowing air into it through a hollow tube (………………)

5-Give a reason for

Particles of steam have higher thermal energy than particles of water

………………………………………………………………………………...

6-What happens to the state of glass when it is healed at very high temperatures

Lesson 2

Activity 4 4 نشاط

Thermal Energy, Heat Transfer and Temperature

الطاقة الحرارية وانتقال الحرارة ودرجة الحرارة

Thermal energy Kinetic energy *is the energy that molecules and atoms of a substance has due to their motion*

الطاقة الحرارية الطاقة الحركية هي الطاقة التي تمتلكها جزيئات وذرات المادة بسبب حركتها

Thermal energy *of a substance relates to* **kinetic energy** *of its molecules and atoms*

- ترتبط الطاقة الحرارية للمادة بالطاقة الحركية لجزيئاتها وذراتها

Where Thermal energy *of a substance is the* **total sum of kinetic energy** *of its molecules and atoms*

حيث_الطاقة الحرارية للمادة هي مجموع الطاقة الحركية لجزيئاتها وذراتها

Example The molecules *of solids are not moving as* **fast** *as* **molecules of liquids**, *so solids have less thermal energy than liquids*

لا تتحرك جزيئات المواد الصلبة بنفس سرعة جزيئات السوائل، لذلك تمتلك المواد الصلبة طاقة حرارية أقل من السوائل

Thermal energy *(heat) transfers from one substance to another have different temperatures, where*

تنتقل الطاقة الحرارية (الحرارة) من مادة إلى أخرى بدرجات حرارة مختلفة، حيث

Heat flows *from a* **hotter** *substance to a* **colder** *substance*

تنتقل الحرارة من مادة أكثر سخونة إلى مادة أكثر برودة

Example *If you hold* **ice cubes in your hand** *that has more thermal energy than the ice cubes, so the ice cubes will melt because heat flows from your hand (hotter substance) to the ice cubes (colder substance)*

مثال إذا كنت تحمل في يدك مكعبات ثلج تحتوي على طاقة حرارية أكثر من مكعبات الثلج، فإن مكعبات الثلج سوف تذوب لأن الحرارة تتدفق من يدك (المادة الأكثر سخونة) إلى مكعبات الثلج (المادة الأكثر برودة)

Temperature *It is a* **measure of the average kinetic energy** *of molecules and atoms of a substance*

درجة الحرارة إنها مقياس متوسط الطاقة الحركية لجزيئات وذرات المادة



When a substance is heated عندما يتم تسخين المادة_

Thermal energy *is transferred to the molecules of the substance.*

تنتقل الطاقة الحرارية إلى جزيئات المادة.

Then, the **molecules gain thermal energy** *and* **move faster** *and this causes*

ثم تكتسب الجزيئات طاقة حرارية وتتحرك بشكل أسرع وهذا يسبب:

The **total kinetic energy** *of the molecules increases.*

زيادة الطاقة الحركية الكلية للجزيئات.

The **temperature** *of substance* **increases** • .

درجة حرارة المادة تزداد

Change of State of Matter

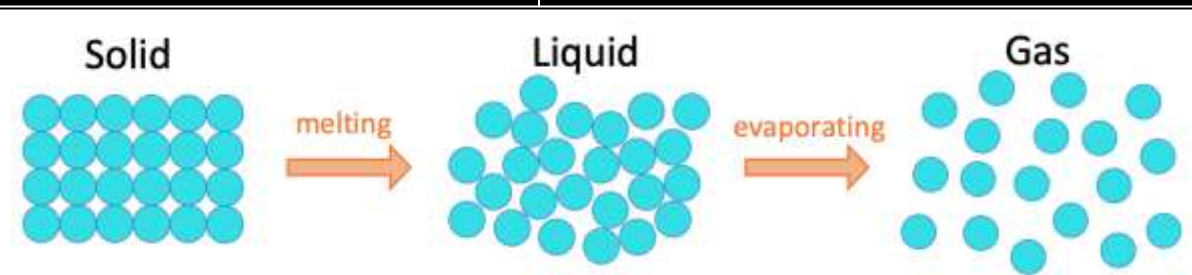
When the thermal energy of a matter Increases, the kinetic energy of its molecules increases and they move with faster speed, this leads to increase the temperature of a matter

عندما تزداد الطاقة الحرارية للمادة، تزداد الطاقة الحركية لجزيئاتها وتتحرك بسرعة أكبر، وهذا يؤدي إلى زيادة درجة حرارة المادة

At certain temperatures, when the thermal energy of a matter changes, the matter will change from one state to another

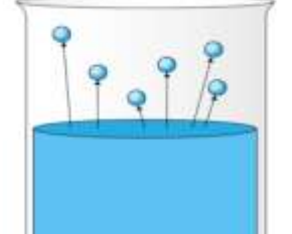
عند درجات حرارة معينة، عندما تتغير الطاقة الحرارية للمادة، تتغير المادة التغيير من حالة إلى أخرى

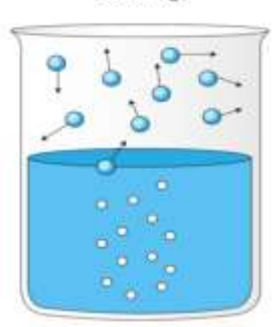
Melting الانصهار	Freezing التجمد
It is the change of state of matter from solid state to liquid state تغير حالة المادة من الحالة الصلبة إلى الحالة السائلة On heating a solid matter عند تسخين المادة الصلبة The thermal energy increases تزداد الطاقة الحرارية The force that holds these molecules together decreases so, they vibrate faster تقل القوة التي تربط هذه الجزيئات ببعضها، لذا فهي تهتز بشكل أسرع Molecules start to get close together so the liquid matter changes to solid matter and this process is called "Freezing" تبدأ الجزيئات في الاقتراب من بعضها البعض وبالتالي السائل تتحول المادة إلى مادة صلبة وتسمى هذه العملية التجميد	It is the change of state of matter from liquid state to solid state هو تغير حالة المادة من الحالة السائلة إلى الحالة الصلبة On cooling a liquid matter عند تبريد المادة السائلة The thermal energy decreases تقل الطاقة الحرارية The force that holds these molecules together increases so, they vibrate slower تزداد القوة التي تربط هذه الجزيئات معًا، لذا فهي تهتز بشكل أبطأ Molecules start to move away from each other, so the solid matter changes to liquid matter and this process is called "melting تبدأ الجزيئات في الابتعاد عن بعضها البعض، فتتحول المادة الصلبة إلى مادة سائلة وتسمى هذه العملية الانصهار;



The following table shows the change from liquid state into gas state and the opposite change from gas state to liquid state at certain temperatures.

Evaporation (vaporization) التبخر (التبخر)	Condensation التكثيف
It is the change of state *of matter from* liquid *state to* gas *state* تغير حالة المادة من الحالة السائلة إلى الحالة الغازية	*It is the* change of state *of matter from* gas *state to* liquid *state* هو تغير حالة المادة من الحالة الغازية إلى الحالة السائلة
On heating a liquid matter. *The thermal energy of molecules of liquid matter increases* عند تسخين المادة السائلة. تزداد الطاقة الحرارية لجزيئات المادة السائلة. **The force that holds t***hese molecules together decreases so, they vibrate more faster* تقل القوة التي تربط هذه الجزيئات معًا لذا فهي تهتز بشكل أسرع	**On cooling a gas matter.** *The thermal energy of molecules of gas matter decreases.* عند تبريد المادة الغازية. تتناقص الطاقة الحرارية لجزيئات المادة الغازية.. **The force that holds** *these molecules together increases so, they vibrate slower.* وتزداد القوة التي تربط هذه الجزيئات معًا، لذا فإنها تهتز بشكل أبطأ
Molecules start *to* **move away from each other,** *so the liquid matter vaporizes into gas matter and this process is called "evaporation"* تبدأ الجزيئات بالابتعاد عن بعضها البعض، فتتبخر المادة السائلة إلى مادة غازية وتسمى هذه العملية التبخر	**Molecules start** *to* **get close together,** *so the gas matter changes to liquid matter and this process is called "condensation"* تبدأ الجزيئات في التقارب، فتتحول المادة الغازية إلى مادة سائلة وتسمى هذه العملية ;التكثيف
Example: *Water changes to water vapor* مثال: يتغير الماء إلى بخار ماء	**Example:** *Water vapor changes to water.* مثال: يتغير بخار الماء إل







Exercise on Lesson 2

1- Choose the correct answer:

1. When you touch a piece of ice, heat transfers from. ………to………..

a. ice-hand. b. Ice-the body. c. hand-ice d. Ice-air

2-Heat transfers from

a. a cold object to an object that has the same temperature.
b. a hot object to an object that has the same temperature
c. a cold object to a hot object
d. a hot object to a cold object

3- Temperature is a measure of the …………energy of molecules of a substance.

a. kinetic b. potential c. light d. chemical

4-When the molecules of a substance gain thermal energy, their total kinetic energy ………and the temperature of substance.……….

a. decrease-decreases c. decrease-increases
b. increase- increases d. increase decreases

5- Melting point of a substance is the temperature at which………. changes into…………

a. solid-liquid b. liquid-gas c gas-liquid d. liquid-solid

6-Boiling point of a substance is the temperature at which ……….changes into ………..

a. solid-liquid, b. liquid-gas. c gas-liquid. d. liquid-solid

7-The transformation of gas into liquid is called………. and the reverse process is called……

a. melting - evaporation. b. evaporation - melting.
c. evaporation - condensation. d. condensation - evaporation

.2-Choose from column (B) what suits it in column (A)

(A) Process	(B) (Matter changes)
1- Melting	a. from liquid to gas
2-Evaporation	b. evaporation-melting
3- Freezing	c. from solid to gas
4-Condensation	d. from gas to liquid
	e. from liquid to solid

1-………… 2-…………..3-…………..4-…………..

3-Put (√) or (X)

1-Heat flows from a hotter substance to a colder substance ( )
2-If you hold a hot cup of tea with your hand, heat transfers from your hand to the cup. ( )
3. Molecules of solids move faster than molecules of liquids ( )
4-By Increasing the thermal energy of molecules of matter, the force that holds these molecules Increases ( )
5-The transformation of solid to liquid is called melting and the reverse process is called freezing ( )
6-The melting point and boiling point of a substance are considered as physical properties of this substance ( )
7-The boiling point of water is less than that of mercury ( )

4-Write the scientific term of each of the following

1-It is a measure of the average kinetic energy of molecules and atoms of a substance (………………)

2-It is the change of matter from solid state to liquid state (………………)

3-It is the change of matter from liquid state to gas state (………………)

4-It is the change of matter from gas state to liquid state (………………)

5-It is the change of matter from liquid state to solid state (………………)

5-Give reasons for:

1-Ice melts when it is put in a hot cooking pan

……………………………………………………………………………………..

2-Matter may change from one state to another

……………………………………………………………………………………..

3-Evaporation and condensation are two opposite processes

……………………………………………………………………………………..

6-What happens when

1-You hold a piece of frozen chocolate in your hand. (According to transfer of heat

……………………………………………………………………………………..

2-You touch a hot cup of tea (According to transfer of heat)

……………………………………………………………………………………..

3-You heat a piece of butter. (According to change of state)

……………………………………………………………………………………..

Lesson 3

Activity 6 نشاط

Temperature and Particle Movement درجة الحرارة وحركة الجسيمات

how the temperature affects the kinetic energy and the motion of molecules of mater through observing how quickly red dye will spread out in hot and cold water

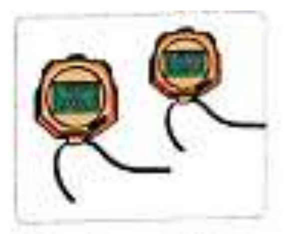
كيفية تأثير درجة الحرارة على الطاقة الحركية وحركة جزيئات المادة من خلال ملاحظة مدى سرعة انتشار الصبغة الحمراء في الماء الساخن والبارد

Tools


Beaker contains 100 ml of hot water.


Beaker contains 100 ml of cold water.


Two eyedroppers contains red dye.


Two stopwatches.

Steps

1-Add **two drops** *of the* **red dye** *to the center of each beaker at the same time*

1-أضف قطرتين من الصبغة الحمراء إلى وسط كل كوب في نفس الوقت



Cold water beaker   Hot water beaker

2-Stan the **two stopwatches** *at* **thee that the drops of red dye** *added to each beaker*

2-أوقف عليك الساعتين اللتين أضيفت إليهما قطرات الصبغة الحمراء في كل كوب


Cold water beaker   Hot water beaker

3-Record the time that the drops of the **red dye take to completely spread out all over the water** *in each beaker*

3-سجل الوقت الذي مرت فيه قطرات الصبغة الحمراء تنتشر الصبغة الحمراء بالكامل في جميع أنحاء الماء في كل كوب

ملاحظة Observation

The red dye spreads out faster in the hot water beaker than the cold water beaker

تنتشر الصبغة الحمراء بشكل أسرع في كوب الماء الساخن من كوب الماء البارد

Conclusions الاستنتاجات

In hot water beaker في كوب الماء الساخن

The **hot water has more thermal energy**, *so molecules of hot water have more - kinetic energy and move faster*

- الماء الساخن يمتلك الماء طاقة حرارية أكبر، لذا فإن جزيئات الماء الساخن تمتلك طاقة حركية أكبر

-So, this causes the red dye takes less time to spread out in the hot water

وتتحرك بشكل أسرع. -لذلك، فإن هذا يجعل الصبغة الحمراء تستغرق وقتًا أقل لتنتشر في الماء الساخن

In cold water beaker في كوب الماء البارد،

The cold water has less thermal energy, so molecules of cold water have less .kinetic energy and move slower

يحتوي الماء البارد على طاقة حرارية أقل، لذا فإن جزيئات الماء البارد لديها طاقة حركية أقل وتتحرك بشكل أبطأ.

So, this causes the red dye takes more time to spread out in the cold water

-لذلك، فإن هذا يجعل الصبغة الحمراء تستغرق وقتًا أطول لتنتشر في الماء البارد


Mr: Alifaz .N .Tadrous
01005136959/ 01222978682

Exercise on Lesson 3

1- Choose the correct answer:

1. Changing from gas to liquid is called ………..

a. melting b. evaporation c. condensation d. freezing

2-When wax melts, its particles………….

a. gain thermal energy and speed up b. gain thermal energy and slow down
c. lose thermal energy and speed up d. lose thermal energy and slow down

3-In which state(s) of matter are the molecules away from each other?.....

a. Solid b. Gas c. Sold and liquid d. Sold and gas

4-The state(s) of matter with the greatest amount of energy is are …………

a. solid b. liquid c. gas d. solid and liquid

5-Water molecules have the lowest kinetic energy when it is in the form of …………

a. ice b. water drops. c. water vapor d. steam

6- Changing ice into water followed by changing water into steam show two different processes which are ………………. and………………..

a. freezing-condensation b. evaporation-condensation
c. melting-freezing d. melting-evaporation

7-. Objects with more thermal energy have………………. kinetic energy

a. more b. less c. the same d. no

2-Put (√) or (X)

1-When the temperature of a matter increases its molecules move slower ( )
2-Hot water molecules have more kinetic energy than cold water ( )
3-Food coloring (dye) spreads out in cold water faster than in hot water ( )
4-Temperature is a measure of the average kinetic energy of the molecules of a matter ( )
5-By decreasing the thermal energy, the kinetic energy increases ( )
6-Kinetic energy is the energy of motion ( )

3-Write the scientific term of each of the following

1-A process in which liquid molecules move faster and change to another state (………………..)
2-A process in which liquid molecules move slower and change to another state .2 (………………..)

4-Give a reason for the following:

Food coloring takes less time to spread out in the hot water than in cold water

……………………………………………………………………………….

5-What happens to

……………………………………………………………………………….



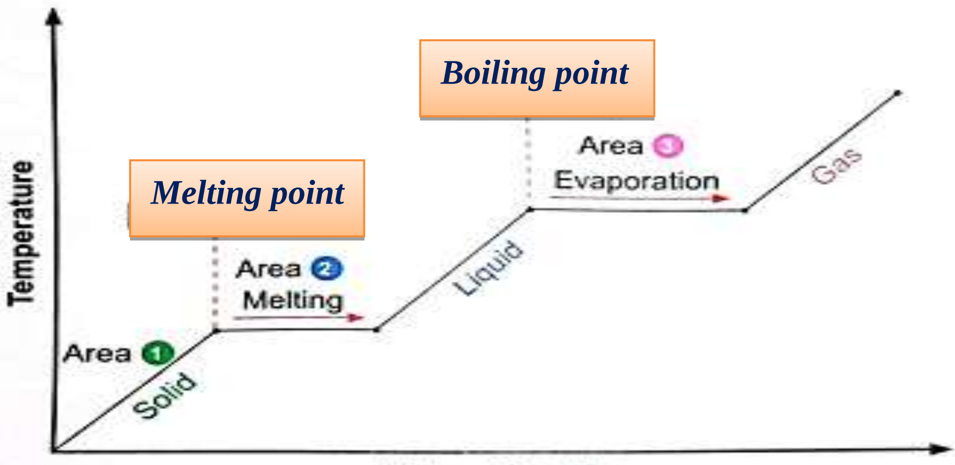
Lesson 4

Activity 7 نشاط

Thermal Energy and Particle Movement الطاقة الحرارية وحركة الجسيمات

We can apply what we have learned in the previous lessons on the following graph that shows the different processes that happen when a beaker of ice cubes was heated until the ice (solid) changes to water (liquid), then water (liquid) changes to water vapor (gas)

الرسم البياني التالي الذي يوضح العمليات المختلفة التي تحدث عند تسخين كوب به مكعبات ثلج حتى يتحول الثلج (الصلب) إلى ماء (سائل)، ثم يتحول الماء (السائل) إلى بخار الماء (غاز)



At area (1). *When the* **ice is heated** *the* **molecules of ice absorb thermal energy** *and they* **move faster** **due to the increase of their kinetic energy**

في المنطقة (1) وعندما يسخن الجليد تمتص جزيئات المولات الطاقة الحرارية وتتحرك بشكل أسرع بسبب زيادة طاقتها الحركية

At area (2). **By increasing the temperature**, **the kinetic energy of ice** **increases** *that leads to decr***ease the force that bonds the molecules of ice together,** *so they slide over each other and ice (solid)* **changes** *to* **water** *(liquid), this temperature is called "melting point"*

عند منطقة (2) وبزيادة درجة الحرارة تزداد الطاقة الحركية لجزيئات الجليد مما يؤدي إلى انخفاض القوة التي تربط جزيئات الجليد ببعضها البعض، فتنزلق فوق بعضها البعض ويتحول الجليد (الصلب) إلى ماء (هذا درجة الحرارة تسمى نقطة الانصهار

Melting point *It is the temperature at which a* **matter changes** *from* **solid** *state to* **liquid** *state*

نقطة الانصهار هي درجة الحرارة التي تتحول عندها المادة من الحالة الصلبة إلى الحالة السائلة

At area (3). *By increasing the temperature, the force that holds the molecules together becomes more weak and they spread in all directions, so water (liquid) changes to water (gas vapor) and this temperature is called "boiling point"*

عند منطقة (3). وبزيادة درجة الحرارة تضعف القوة التي تربط الجزيئات ببعضها وتنتشر في كل الاتجاهات فيتحول الماء (السائل) إلى ماء (بخار الغاز) وتسمى درجة الحرارة هذه;نقطة الغليان;

Boiling point نقطة الغليان

It is the temperature at which a **matter changes** *from* **liquid** *state to* **gas** *state*

هي درجة الحرارة التي تتحول عندها المادة من الحالة السائلة إلى الحالة الغازية



Note ملاحظة

The melting point and boiling point are physical properties of matter

درجة الانصهار ونقطة الغليان من الخواص الفيزيائية للمادة

Examples أمثلة

.Ice has a melting point of zero degree (0°C)

. درجة انصهار الجليد هي صفر درجة (0 درجة مئوية).

Water has a boiling point of 100°C درجة غليان الماء هي 100 درجة مئوية

Mercury has a boiling point of 357°C. - درجة غليان الزئبق هي 357 درجة مئوية

Activity 8 نشاط

التمدد الحراري Thermal Expansion

The matter behaves differently when they are heated or cooled, where

تتصرف المادة بشكل مختلف عندما يتم تسخينها أو تبريدها، حيث

When we cool a matter, *the spaces between its molecules decrease and the molecules come close together (contract) and this is called "**Condensation**"*

عندما نقوم بتبريد مادة ما، تقل المسافات بين جزيئاتها وتقترب الجزيئات من بعضها البعض (التقلص) وهذا ما يسمى;التكثيف

When we heat a matter, *the spaces been its molecules increase and the molecules spread out (expand) and this is called "**expansion**"*

عندما نقوم بتسخين المادة، تزداد المساحات بين جزيئاتها وانتشرت الجزيئات (تمدد) وهذا ما يسمى التمدد

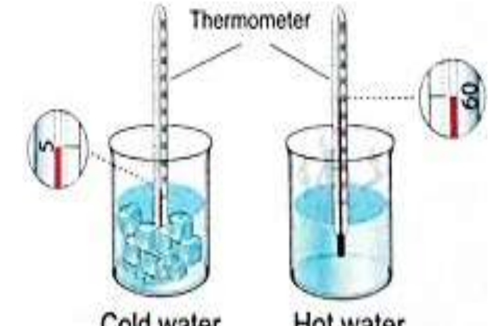
some examples of the contraction and expansion of some matter

بعض الأمثلة على تقلص وتمدد بعض المواد

الترمومتر Thermometer

Some thermometers contain alcohol (liquid) mixed with color

تحتوي بعض موازين الحرارة على كحول (سائل) مخلوط مع اللون



When the thermometer *is placed in* **hot** *substance, the temperature of* **alcohol increases and the spaces** *between its molecules increase, so the* **molecules of alcohol spread** *out and* **expand** *giving* **high** *level of* **temperature** *in the thermometer*

عند وضع الترمومتر في مادة ساخنة تزداد درجة حرارة الكحول وتزداد المسافات بين جزيئاته، فتنتشر جزيئات الكحول وتتوسع مما يعطي درجة حرارة عالية في الترمومتر

When the thermometer is placed in cold substance, *the temperature of* **alcohol decreases** *and the* **spaces** *between its molecules* **decrease**, *so the molecules of alcohol come* **close together** *and contract giving* **low level** *of temperature in the thermometer*

عندما يكون الترمومتر عند وضعه في مادة باردة تنخفض درجة حرارة الكحول وتقل المسافات بين جزيئاته، فتتقارب جزيئات الكحول من بعضها البعض وتتقلص مما يؤدي إلى انخفاض درجة الحرارة في الترمومتر

Jars الجرار

.Sometimes it is hard to open the lid of the jar -

- في بعض الأحيان يكون من الصعب فتح غطاء الجرة.

When you pour hot water on the lid of the jar, it opens easily, .where The lid of the jar is made of metal

- عندما تصب الماء الساخن على غطاء الجرة، فإنه يفتح بسهولة، حيث: غطاء الجرة مصنوع من المعدن

When hot water is poured on the metal lid, the temperature of the metal lid increases and the spaces between its molecules increase, so the molecules of metal lid spread out and expand, so it can be easily opened

عند صب الماء الساخن على الغطاء المعدني، ترتفع درجة حرارة الغطاء المعدني وتزداد المسافات بين جزيئاته، فتنتشر جزيئات الغطاء المعدني وتتوسع، فيسهل فتحه

Bridges are made up of steel (metal) and concrete

الجسور تتكون من الفولاذ (المعدن) والخرسانة.

When bridges are exposed to hot weather, the temperature of metal increases and the spaces between its molecules increase, so the molecules of metal spread out and expand

-عندما تتعرض الجسور للطقس الحار ترتفع درجة حرارة المعدن وتزيد المسافات بين جزيئاته، فتنتشر جزيئات المعدن وتتوسع.

So, engineers use expansion joints to keep bridges safe from buckling when they expand at high temperatures

-لذلك، يستخدم المهندسون وصلات التمدد للحفاظ على الجسور آمنة من الانبعاج عندما تتمدد عند درجات حرارة عالية

.

Exercise on Lesson 4

1- Choose the correct answer:

1. On a very hot summer morning, water on the ground may turn into water vapor. this change is called ………..

a. melting b. evaporation. c. freezing. d. condensation

2. Some thermometers contain a colored alcohol, what happens to alcohol when the thermometer is placed in hot water

a. Alcohol contracts b. Alcohol evaporates
c. Alcohol changes its color d. Alcohol expands

3-When the temperature of a rod of iron is increased

a. its length increases b. its length decreases to its half
c. its length doesn't change d. its length decreases to its quarter

4-When the temperature of alcohol inside thermometers increases, its volume

a. increases causing its contraction b. decreases causing its expansion
c. decreases causing its contraction d. increases causing its expansion

5-As a result of heat flow through metals, they

a. expand b. contract c. get smaller d. are not affected

6-Expansion joints are designed to allow concrete ………… when temperature.……. to keep bridges safe from buckling

a. expands- decreases b. expands - increases
c. expands- doesn't change d. contract - doesn't change

7-When a thermometer is placed in a cup of iced water, the liquid inside the thermometer …………… due to its………….

a. goes down - expansion b. rises up - expansion
c. goes down - contraction d. rises up - contraction

2-Put (√) or (X)

1- The decrease in volume of matter that occurs when matter is cooled is called expansion ( )
2- When an object gains heat, Its temperature Increases and its state may change ( )
3-We can measure the temperature by using thermometers ( )
4-The main idea to make a thermometer is changing the volume of liquid inside it according to the temperature ( )
5-When a substance is cooled, its molecules come close together ( )
6-If it is hard to open the lid of the jar, we need to pour cold water on the lid of the jar to open it easily ( )
7-When objects lose heat, they contract ( )
8-When a substance expands, its volume increases ( )

3-Write the scientific term of each of the following

1-A device used to measure the temperature (……………………)
2-The increase in the volume of a material as its temperature increases (……………………)
3-The decrease is the volume of a material as its temperature decreases (……………………)

4-Joints between parts of a bridge that allow its expansion without being damaged (…………………….)

4-Give reasons for:

1-Engineers use expansion points in the designing of bridges

……………………………………………………………………………

2-The level of alcohol inside a thermometer rises up if we put it inside hot water. and goes down if we put it inside cold water

……………………………………………………………………………

3-Pouring hot water over a metal lid of a glass jar makes it easier to open the jar

……………………………………………………………………………..

4-What happens to

1-Bridges if engineers don't use expansion joints in their designing

…………………………………………………………………………… .

2-The level of alcohol inside a thermometer if we put it inside hot water

……………………………………………………………………………

3-The level of alcohol inside a thermometer if we put it inside cold water

……………………………………………………………………………

4-The spaces between molecules of a matter if we heat it

……………………………………………………………………………

Lesson 5

Activity 9

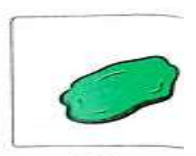
Making a Thermometer

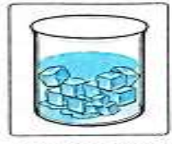
make a model of a thermometer


Plastic bottle contains 50 ml of alcohol and 50 ml of water


Plastic straw


A bowl contains hot water


Clay


A bowl contains


Eyedropper contai red dye

Steps

1-Add three drops of the red dye in the plastic bottle

1- اضف ثلاث قطرات من الصبغة الحمراء في الزجاجة البلاستيكية

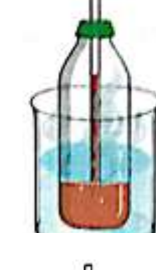
2-Put the straw in the bottle and fix it by using the clay as shown, than measure the height of red the row temperature

2-قم بتفتيت الشالمو في الزجاجة وثبتها باستخدام الطين كما هو موضح ، من قياس ارتفاع درجة حرارة الصف الأحمر

Model of a thermomet

3-Place the plastic bottle into a bowl of hot water and measure the height of the red liquid in the straw

ضع الزجاجة البلاستيكية في وعاء من الماء الساخن وقياس ارتفاع السائل الأحمر في القشة



Observation *The height of the red liquid in the straw increases when the bottle is placed into the hot water*

يزداد ارتفاع السائل الأحمر في القش عند وضع الزجاجة في الماء الساخن

4-Place the plastic bottle into a bowl of cold water and measure the height of the red liquid in the straw

ضع الزجاجة البلاستيكية في وعاء من الماء البارد وقياس ارتفاع السائل الأحمر في القشة



Observation *The height of the red liquid in the straw decreases when the plastic bottle is placed into the cold water*

ارتفاع السائل الأحمر في القش يتناقص عند وضع الزجاجة البلاستيكية في الماء البارد

Conclusions

In a bowl of hot water في وعاء من الماء الساخن

The temperature of red liquid increases, so the molecules of red liquid spread out and the spaces between them increase

تزداد درجة حرارة السائل الأحمر ، وبالتالي فإن جزيئات السائل الأحمر تنتشر وتزداد المسافات بينهما

This leads to the expansion of the molecules of red liquid and increase in the height of red liquid in the straw

ويؤدي ذلك إلى تمدد جزيئات السائل الأحمر وزيادة ارتفاع السائل الأحمر في القش

In a bowl of cold water

The temperature of red liquid decreases, so the molecules of red liquid come close together and the spaces between them decrease

تنخفض درجة حرارة السائل الأحمر، فتتقارب جزيئات السائل الأحمر من بعضها وتقل المسافات بينها

-This leads to the contraction of the molecules of red liquid and decrease in .the height of red liquid in the straw

-Place the plastic bottle into a bowl of hot water and measure the height of the red liquid in the straw

وهذا يؤدي إلى تقلص جزيئات السائل الأحمر وانخفاض ارتفاع السائل الأحمر في القشة

ضع زجاجة بلاستيكية في وعاء من الماء الساخن وقياس ارتفاع السائل الأحمر في القشة.

Activity 9

Increasing Thermal Energy

The thermal energy of matter increases, so the molecules of a matter move faster and their kinetic energy increases -So, the temperature of a matter increases

Check your understanding

Complete the following diagram using the words below

(increases-expand-faster-temperature-rise)

When the thermal energy of a matter increases

↓

The kinetic energy of its molecules ………and move………..

↓

The spaces between molecules of a matter ………….

↓

So, the……….. of matter will rise and this matter will…….

Exercise on Lesson 5

1- Choose the correct answer:

1. During melting process, matter starts to change from……… state to…… state

a. solid-liquid b. liquid-solid c. liquid - gas d. solid-gas

2-The temperature………… during the melting of solids

a. decreases b. increases

c. does not change d. may increase or decrease

3-By decreasing the temperature of a substance, its molecules move …….. each other and the spaces between them……….

a. farther away – increase b. nearer to increase

c. farther away - decrease d. nearer to decrease

4- By increasing the temperature of a substance, its molecules move …….. each other and the spaces between them……….

.a. farther away – increase b. nearer to- increase

c. farther away - decrease d. farther away - decrease

5-A metallic rod of 50 metre length was heated at high temperature, its length could reach………. metre after heating

a. 47 b. 48 c. 49 d. 51

6-Materials ……….on heating

a. expand b. contract c. compress d. does not change

7-A tightly closed metal lid of a glass bottle can be opened more easily if it is put in ………….for some time

a. cold water b. iced water c. cold vinegar d. hot water

2-Put (√) or (X)

1-When the temperature of solids increases, their volume decrease ( )

2-Substances change from liquid state into gas state during evaporation process ( )

3-Spaces between molecules of a substance increase by decreasing the temperature of this substance ( ) ( )

4-Expansion and contraction of matter occur due to changes in temperature

5-Expansion and contraction are two opposite processes ( )

6-When a liquid is cooled, it may change into gas ( )

3-Write the scientific term of each of the following

1-The site of matter which changes into quid state by healing (………………)

2-The state of mat which changes into liquid state by cooling(………………)

3. It is the increase of the son of a substance due to increasing of its temperature (………………)

4-It is the decrease of the size of a substance due to decreasing of its temperature (………………)

4-Complete the following sentences using the words below

(expand-contract-faster-slower-increase-decrease-near to-away from-thermometer)

1-Cooling causes mater to ………..and cases particles to move………..

2. When a liquid is breezed, the spaces between its molecules……….. causing their movement…………… each other t

3-Healing causes matter to …………and cases particles to move………
4-When a liquid is heated, the spaces between its molecules………….
causing their movement…………… each other
5 Expansion and contraction of liquid explain how a……….work

5-Give reason for

1-Matter expands when its thermal energy increases

…………………………………………………………………………...

2-The size of a balloon decreases if it is subjected to a cold weather

…………………………………………………………………………...

6-What happens to

1-The size of an inflated balloon if it is put in hot weather

…………………………………………………………………………...

2-The volume of matter when it is cooled

…………………………………………………………………………...

Lesson 6

Activity 12

STEM in Action

Engineers use some techniques to protect bridges and railroad tracks from expansion or contraction in different conditions of weather

يستخدم المهندسون بعض التقنيات لحماية الجسور ومسارات السكك الحديدية من التمدد أو الانكماش في ظروف الطقس المختلفة

Examples أمثلة



In bridges في الكباري

When the temperature increases in hot weather or decreases in cold weather, the metal that made up bridges expands and contracts

عندما تزيد درجة الحرارة في الطقس الحار أو تنخفض في الطقس البارد، فإن المعدن الذي يتكون منه الجسور يتمدد و العقود

So. engineers use expansion joints to keep .bridges safe over time

هكذا. يستخدم المهندسون فواصل التمدد للحفاظ على سلامة الجسور مع مرور الوقت.

In railroad tracks في مسارات السكك الحديدية

Railroad tracks are made of iron

مسارات السكك الحديدية مصنوعة من الحديد

Engineers leave small spaces between the road tracks to allow these tracks to end in hot weather without being bent to avoid train accidents

-يترك المهندسون مساحات صغيرة بين مسارات الطريق للسماح لهذه المسارات بالانتهاء في الطقس الحار دون التعرض لحوادث القطارات

Check your understanding

-Put (√) or (X)

1-Engineers use expansion joints to keep bridges safe from expansion in cold weather (   )

To avoid train accidents, engineers leave small spaces between the railroad tracks to avoid bending the tracks (   )

Exercise on Lesson 6

1- Choose the correct answer:

1. Metallic parts of a bridge………… In different temperatures

a. expand only *b. contract only*
c. expand and contract *d. never expand or contract*

2-When the kinetic energy of liquids decreases, they may

a. expand *b. contract* *c. evaporate* *d. disappear*

3-Railroad tracks are made up of……..

a. glass *b. coal* *c. plastic* *d. iron*

4-Engineers leave ………….between railroad tracks

a small spaces *b. very large spaces* *c. large spaces* *d. no spaces*

5-Materials ……………by…………… their temperatures

a. expand-decreasing *b. contract-increasing*
c contract-decreasing *d. melt-decreasing*

2-Put (√) or (X)

1-Engineers use expansion joints to keep bridges safe ( )
2-Temperature increases in hot weather causing contraction of materials( )
3-Railroad tracks are made up of iron ( )
4-No spaces are left between railroad tracks ( )
5-Without leaving spaces between railroad tracks, train accidents may occur( )
6-Volume of metals increases during expansion and decreases during contraction ( )

3-Write the scientific term of each of the following:

1-Joints allow expansion and contraction of some parts of bridges during temperature changes (………………)
2-Decreasing the volume of a substance as a result of decreasing its temperature (………………)
3-It is the state of matter that has a fixed shape and spaces between its molecules are very narrow
4-the state that doesn't have fixed shape or volume (………………)

4-Give reasons for

1-Expansion joints are designed in bridges

……………………………………………………………………………...

2-Small spaces are left between the railroad tracks

……………………………………………………………………………...

What happens to

1-Bridges if expansion joints are not designed

……………………………………………………………………………...

2-The railroad tracks if no spaces are left between them.

Concept 2.2

Heat transfer

Lesson 1

What happens to an object when heat is transferred

ماذا يحدث لجسم ما عندما يتم نقل الحرارة؟

Heat transfers from *the* **hotter** *object to the* **cooler** *object that causes the molecules in object with lower temperature will start to move faster while the molecules of the object with higher temperature will move slower*

تنتقل الحرارة من الجسم الأكثر سخونة إلى الجسم البارد مما يتسبب في أن الجزيئات الموجودة في الجسم ذي درجة الحرارة المنخفضة ستبدأ في التحرك بشكل أسرع بينما تتحرك جزيئات الجسم ذو درجة الحرارة المرتفعة بشكل أبطأ

Example

In the opposite picture وفي الصورة المقابلة



The rock absorbs thermal energy from the Sun rays, so the molecules of the rock move faster

يمتص الصخر الطاقة الحرارية من أشعة الشمس، فتتحرك جزيئات الصخر بشكل أسرع

When the lizard stands on the rock, the skin of lizard .absorbs thermal energy that is released from the rock

عندما تقف السحلية على الصخر، يمتص جلد السحلية الطاقة الحرارية المنطلقة من الصخر

So, the molecules of the rock will move slower while the molecules in the .skin of lizard will move faster

. لذا فإن جزيئات الصخر ستتحرك بشكل أبطأ بينما ستتحرك الجزيئات الموجودة في جلد السحلية بشكل أسرع.

What heat is

-Thermal insulation and conductivity
-Conduction, convection and radiation
-Heat and conservation of mass

Thermal energy *transfers when two materials with different temperatures touch each other. The thermal energy transfers from the object with higher .temperature to the object with lower temperature*

تنتقل الطاقة الحرارية عندما تتلامس مادتان لهما درجات حرارة مختلفة. تنتقل الطاقة الحرارية من الجسم ذو درجة الحرارة الأعلى إلى الجسم ذي درجة الحرارة الأقل.

There are two types of materials *according to their ability to transfer thermal energy which are thermal insulators and thermal conductors*

هناك نوعان من المواد حسب قدرتها على نقل الطاقة الحرارية وهي العوازل الحرارية والموصلات الحرارية

Thermal conductors	**Thermal insulators**
(Good conductors of heat)	*(Bad conductors of heat)*
They are materials that allow thermal energy to transfer through . وهي مواد تسمح بانتقال الطاقة الحرارية من خلالها	*They are materials that resist the* وهي مواد *transfer of thermal energy* تقاوم انتقال الطاقة الحرارية
Example: Metals such as iron	*Example Plastic*

Example



Iron *is a* **thermal conductor** *that transfers the heat of the electric iron to the cloth in order to ironing it*

Plastic *is a* **thermal insulator** *that does not allow heat to transfer through,*
so you can hold it without feeling the hotness of the electric iron

انتقال الحرارة Heat Transfer

Some properties of heat بعض خواص الحرارة



1-Heat flows from a hotter object to a cooler object
تنتقل الحرارة من جسم أكثر سخونة إلى جسم أكثر برودة
2-Heat is an essential component of life on Earth
الحرارة عنصر أساسي للحياة على الأرض
3-Heat cannot be lost but it is only transferred
لا يمكن فقدان الحرارة بل تنتقل فقط

Thermal energy *relates to the total sum of the kinetic energy of molecules and atoms of a substance, so any substance has thermal energy even the cold substances as they have molecules that always move*
الطاقة الحرارية تتعلق بمجموع الطاقة الحركية لجزيئات وذرات المادة، لذا فإن أي مادة لها طاقة حرارية حتى المواد الباردة حيث أن لها جزيئات تتحرك دائمًا

Exercise on Lesson 1

1- Choose the correct answer:

1-Any matter has thermal energy, because …………
a. its molecules always move. *b. it has fixed shape*
c. its molecules don't move *d. It has fixed volume*

2-If heat transfers to a lower temperature object, its molecules will
a. slop moving *b. move slower* *c. move faster* *d. not be affected*

3-Heat transfers from ……………..object to …………..object
a. cooler-hotter *b. hotter-cooler* *c. bigger-smaller* *d. smaller-bigger*

4-The handle of an electric iron is made
a. iron *b. thermal insulator material* *c. metal* *d. thermal conductor material*

5-All the following are properties of heat, except ………..
a. it is an essential component of life on Earth
b. it cannot be lost but it is only transferred
c. It flows from a cooler object to a hotter object
d. it flows from a hotter object to a cooler object

6-If you stand on hot sand in barefeet, you will feel the hotness of the sand because
a. heat transfers from your legs to sand *b. heat transfers from sand to your legs*

c. your legs are hotter than sand
d. your legs and sand have the same temperature

7-If you hold an ice cube in your hand, which of the following sentences is correct

a. Your hand temperature is lower than the ice temperature
b . The ice temperature is higher than your hand temperature
c. The ice and your hand have the same temperature
d. The molecules of ice will start to move faster

2-Choose from column (B) what suits it in column (A)

(A)	(B)
1- Plastic	a. is an essential component of life on Earth
2- Metal	b. is used to make the electric iron handle
3- Heat	c. is a thermal conductor
	d. is the measuring unit of volume

1-………… 2-…………3-………….

3-Put (√) or (X)

1-When objects with the same temperature touch each other, heat transfer takes place ( )
2-Heat transfers from the cooler object to the hotter object ( )
3-The molecules of the hotter object move slower than that of the cooler object ( )
4-Thermal conductors are good conductors of heat ( )
5-Plastic resists the transfer of thermal energy ( )
6-In electric iron heat transfers from cloth to iron ( )
7-Heat transfers between two objects that have the same temperature ( )
8-Thermal energy relates to the total sum of the kinetic energy of substance's atoms and molecules ( )
9-Molecules of cold or hot substances always move ( )

4-Write the scientific term of each of the following

1-They are materials that allow thermal energy to transfer through(….……..)
2-They are materials, that resist the transfer of thermal energy(….…….…..)
3-Thermal insulator material used to make the handle of an electric iron (….…………..)
4-Thermal conductor material used to make lower part of an electric iron that is used in ironing clothes (….…………..)

5-Give reasons for

1-The handle of an electric iron is made of plastic

……………………………………………………………………………………...

2-The lower part of an electric iron is made of iron

……………………………………………………………………………………...

3-You feel heat, when you touch a metal spoon placed in a hot cup of tea

……………………………………………………………………………………...

6-What happens to

The molecules' movement of a lizard's skin when it stands on a rock in a sunny day

……………………………………………………………………………………..
.

Lesson 2

all materials around us are composed of molecules and atoms that vibrate all the time

جميع المواد من حولنا تتكون من جزيئات وذرات تهتز طوال الوقت

When a matter becomes warmer, the kinetic energy of its atoms or molecules increases, and when that happens, the molecules vibrate faster

عندما تصبح المادة أكثر دفئا، تزداد الطاقة الحركية لذراتها أو جزيئاتها، وعندما يحدث ذلك، تهتز الجزيئات بشكل أسرع

How does matter become warmer كيف تصبح المادة أكثر دفئا

Matter gets warmer *by transferring of* **thermal energy** *from* **hotter matter** *to* **cooler one** *that is known as* **heat**

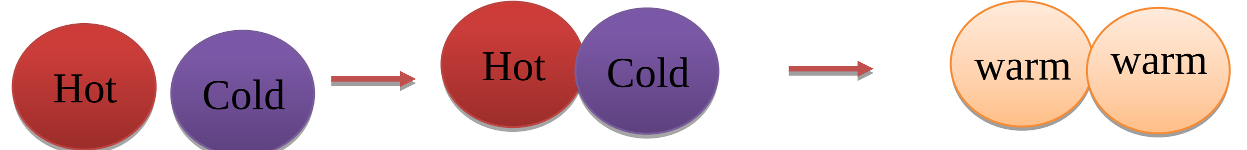
تصبح المادة أكثر دفئًا عن طريق نقل الطاقة الحرارية من مادة أكثر سخونة إلى مادة أكثر برودة تُعرف بالحرارة

Example *When a* **hot food is left on a table for sometime,** *it gets cold because* **heat flows from the hot food to the cooler air** *around it*

عند ترك طعام ساخن على الطاولة لبعض الوقت، يصبح باردًا لأن الحرارة تتدفق من الطعام الساخن إلى المبرد الهواء المحيط به.

So, **heat is transferred** *when there is a* **temperature difference between two objects** *and it flows from the hotter object to the cooler one until both objects reach the same temperature that is known as thermal equilibrium.*

إذن تنتقل الحرارة عند وجود اختلاف في درجة الحرارة بين جسمين وتنتقل من الجسم الأكثر سخونة إلى الجسم البارد حتى يصل الجسمان إلى نفس درجة الحرارة وهو ما يعرف بالتوازن الحراري.



The heat transfers from higher temperature object (A) to lower temperature object (B), until they are equal in temperature

Notes *.The measuring unit of heat is called calorie*

وحدة قياس الحرارة تسمى السعرات الحرارية .

If you hit a piece of metal several times by a hammer, the piece of metal becomes warm

إذا ضربت قطعة معدنية عدة مرات بمطرقة، تصبح قطعة المعدن دافئة

Activity 5 Final Temperature

thermal energy flows from an higher temperature object to lower temperature object

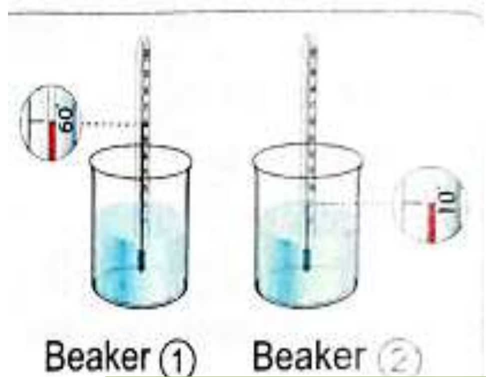
How thermal energy flows and how thermal equilibrium takes place

كيفية تدفق الطاقة الحرارية وكيفية التوازن الحراري يحدث.

Tools *Empty beaker-Beaker contains 100 ml. of hot water with temperature (60°C) - Beaker contains 100 ml. of cold water with temperature (10°C) - Thermometer - Spoon*

كوب فارغ-كوب يحتوي على 100 مل. من الماء الساخن بدرجة حرارة (60 درجة مئوية) - كوب يحتوي على 100 مل. من الماء البارد بدرجة حرارة (10 درجة مئوية) - ميزان الحرارة - ملعقة.

الخطوات **Steps**

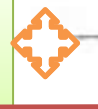


1-Record the temperature of water in beaker (60°C) and the temperature of water in beaker 2 (10°C) in the table below

سجل درجة حرارة الماء في الدورق (60 درجة مئوية) ودرجة حرارة الماء في الدورق 2 (10 درجة مئوية) في الجدول أدناه

2-Calculate the average temperature of water in the two beakers using the following rule

احسب متوسط درجة حرارة الماء في الكأسين باستخدام القاعدة التالية

Average temperature of water = (*Temperature of water in beaker (1)*  *Temperature of water in beaker (1)*) / 2

Then, record the average temperature of water in the table below

ثم سجل متوسط درجة حرارة الماء في الجدول أدناه

3-Pour the two amounts of water in the empty beaker, then use the spoon to mix them together

اسكب مقداري الماء في الدورق الفارغ ثم استخدم الملعقة لخلطهما معًا

4-Wait for 3 minutes and measure the final temperature of the third beaker and record it in the table below

انتظر 3 دقائق وقم بقياس درجة الحرارة النهائية للكوب الدورق الثالث وسجله في الجدول أدناه

Figure (2)

5-Compare the final temperature of water to the average temperature of water that you have calculated before

قارن درجة حرارة الماء النهائية مع متوسط درجة حرارة الماء التي حسبتها من قبل

Temperature of hot water	*60 °c*
Temperature of cold water	*10 °c*
Average temperature of water	$\frac{60\,°c + 10\,°c}{2} = 35\,°c$
Final temperature of water after mixing	*33 °c*

الملاحظة **Observation**

The final temperature of water (33°C) almost equals the average temperature of water (35°C) that you have calculated before

درجة الحرارة النهائية للماء (33 درجة مئوية) تساوي تقريبًا متوسط درجة حرارة الماء (35 درجة مئوية) التي حسبتها من قبل

Conclusion *When two substances with different temperatures come in contact with each other, thermal energy transfers from the hotter object to the cooler object until thermal equilibrium happens and they reach the same temperature*

الاستنتاج عندما تتلامس مادتان لهما درجات حرارة مختلفة مع بعضهما البعض، تنتقل الطاقة الحرارية من الجسم الأكثر سخونة إلى الجسم البارد حتى يحدث التوازن الحراري ويصلان إلى نفس درجة الحرارة

Notes *When mixing two substances with different temperatures, their final temperature at thermal equilibrium almost equals their average*

temperature, so the final temperature of them is between the temperature of the hotter substance and the temperature of the cooler substance

ملاحظات عند خلط مادتين لهما درجات حرارة مختلفة فإن درجة حرارتهما النهائية عند التوازن الحراري تساوي تقريبا متوسط درجة حرارتهما، وبالتالي تكون درجة الحرارة النهائية لهما بين درجة حرارة المادة الأكثر سخونة ودرجة حرارة المادة الباردة

The final temperature when mixing *two substances with different temperatures is* **less than their average temperature** *as there is some thermal energy transfers to the air or the container*

تكون درجة الحرارة النهائية عند خلط مادتين لهما درجات حرارة مختلفة أقل من متوسط درجة حرارتهما لوجود بعض الطاقة الحرارية التي تنتقل إلى الهواء أو الوعاء

After mixing two substances *with different temperatures, the motion of their molecules changes, where*

بعد خلط مادتين لهما درجات حرارة مختلفة تتغير حركة جزيئاتهما، حيث

.**The molecules of the hotter** *substance* **become slower** *after mixing*

جزيئات المادة الأكثر سخونة تصبح أبطأ بعد الخلط.

.**The molecules of the cooler** *substance* **become faster** *after mixing*

جزيئات المادة الباردة تصبح أسرع بعد الخلط

Exercise on Lesson 2

1- Choose the correct answer:

1-The average temperature is almost ………..the final temperature of the mixture of two substances with different temperatures at the thermal equilibrium

a. more than b. less than c. equal to d. double

2-If you pour a cup of water with temperature 30°C to another cup of water with temperature 80°C, the final temperature of the mixture may be

a. 80°C b. 30°C c. 50°C d. 110°C

3-The final temperature of two mixed substances with different temperatures is less than that of the …………….substance and greater than that of the………… substance

a. hotter-cooler b. cooler-hotter c. bigger-smaller d. smaller-bigger

4-After mixing two substances with different temperatures, the molecules of the cooler substance

a. will move faster b. will not be affected c. will move slower d. will stop moving

5- In the opposite figure, if some thermal energy of mixture transfers to the cup, the final temperature of this mixture will be the average temperature………

a. equal to b. double c. more than d. less than

6-……………occurs when heat transfer stops between two objects as they rea the same temperature

a. Calorie b. Heat flow

c. Sound equilibrium d Thermal equilibrium

7-The measuring unit of heat is called………….

a. calorie b. kilogram c. gram d. meter

8-Hitting a piece of metal several times by a hammer causes…………

a. the temperature of the metal becomes lower b. molecules of the metal move slower

c. molecules of the metal move faster d. the metal becomes cooler

9-On heating a substance, the of its molecules

a. kinetic energy-decreases b. kinetic energy-Increases

c. temperature-decreases d. movement-decreases

3-Put (√) or (X)

1-When mixing two substances with different temperatures, their average temperature is lower than their final temperature ( )
2-After mixing two substances with different temperatures the molecules movement of the cooler substance becomes slower ( )
3- The final temperature of two mixed substances with different temperatures is between the temperatures of hotter and cooler substances ( )
4-The temperature of a hotter substance increases after it is mixed with a cooler substance ( )
5-When you add some cool water to hot tea the molecules of tea will move slower ( )
6-When kinetic energy of molecules decreases, they vibrate slower ( )
7-Heat is measured in calorie ( )
8-Thermal equilibrium means that the objects in contact reach the same temperature ( )

3-Write the scientific term of each of the following

1-It occurs when heat transfer stops between two objects reach the same temperature (…………………..)
2-It is the measuring unit of heat (…………………..)

4-Complete the following sentences using the words below

(thermal equilibrium - faster-equals - hotter-cooler)
1-When you mix two substances with different temperatures, their final temperature at thermal equilibrium almost their average temperature
2-Molecules of cooler substance move substance after mixing it with hotter
3-The final temperature of two mixed substances with different temperature is between the temperature of the ……….substance. and the temperature of the……….. substance
4-When mixing two substances with different temperatures, they reach the same temperature at……………

5- Give reasons for:

1-Sometimes the final temperature of a mixture of two substance with different temperature is less than their average temperature
………………..………………..………………..………………..
2-Heat transfer stops after a while between two mixed substances with different temperatures
………………..………………..………………..………………..
3-After mooing two substances with different temperatures the molecules of the hotter substance move slower……………………..………………..………………..………
4-The vibration of molecules of a mater increases when becomes warmer
………………..………………..………………..……………….

6-What happens to

1-Molecules movement of a hotter substance after mixing with a cooler substance
………………..………………..………………..………………..
2-The heat transfer, when thermal equilibrium takes place between a hot and a cold objects
………………..………………..………………..………………..
3-The kinetic energy of molecules of a matter when becomes warmer
………………..………………..………………..………………..
4-The temperature of it piece of metal when you hit it several times with hammer

Lesson 3

Activity 6 Conduction, Convection and Radiation



The kid feel the heat of the fire although does not touch the fire - Heat can transfer from the fire to the kid's hand through the air

يشعر الطفل بحرارة النار على الرغم من عدم ملامستها للنار

- يمكن للحرارة أن تنتقل من النار إلى يد الطفل عن طريق الهواء

Heat can transfer by three different ways, which are



Conduction التوصيل	Convection الحمل	Radiation الإشعاع

Conduction

Heat transfers by conduction when objects with different temperatures touch each other

Example

When you have a fever and your temperature is high. you put cooling pads to transfer the heat from your body to the cooling pads by direct contact

,When we cook noodles, we put noodles and water in a pot

.عندما نقوم بطهي المكرونة، نضع المكرونة والماء في وعاء

During heating, *the noodles close to the bottom of the pot that near the heat source get hot and rise to the surface, then cold noodles at the surface moves .down to the bottom of the pot and so on*

أثناء التسخين، تسخن المكرونة القريبة من قاع الإناء القريب من مصدر الحرارة وترتفع إلى السطح، ثم تتحرك المكرونة الباردة الموجودة على السطح إلى أسفل إلى قاع الإناء وهكذا.

* **The movement of noodles up and down** *shows the movement of water in the pot during heating, where*

- * حركة الشعرية إلى الأعلى والأسفل تدل على حركة الماء في الوعاء أثناء التسخين، حيث:

Hot water at the bottom of the pot moves up

- الماء الساخن الموجود في قاع الإناء يتحرك للأعلى.

,Cold water at the surface of the pot moves down

يتحرك الماء البارد على سطح الوعاء إلى الأسفل.

The continuous movement of water up and down causes the transfer of heat .through water by a way known as convection

تؤدي الحركة المستمرة للماء لأعلى ولأسفل إلى انتقال الحرارة عبر الماء بطريقة تعرف بالحمل الحراري.

Cold water sinks

يغرق الماء البارد

Hot water raise

: Radiation إشعاع

.Heat transfers by radiation through gases and space

تنتقل الحرارة بالإشعاع عبر الغازات والفضاء.

مثال Example

When your hand gets close to a fire, you feel warm because the a ir between the fire and your hand allows the thermal energy of the .fire to transfer to your hand

عندما تقترب يدك من النار، تشعر بالدفء لأن الهواء الموجود بين النار ويدك يسمح للطاقة الحرارية للنار بالانتقال إلى يدك.

- In sunny days, we feel the heat of the Sun although there is a space between the Sun and Earth. Space where the thermal energy of the Sun transfers to .Earth through the space by a way known as radiation

- في الأيام المشمسة نشعر بحرارة الشمس بالرغم من وجود مسافة بين الشمس والأرض. الفضاء حيث تنتقل الطاقة الحرارية من الشمس إلى الأرض عبر الفضاء بطريقة تعرف بالإشعاع.

The speed of transfer of heat

The speed of heat transfer between objects increases when

1-The difference in temperature between objects increases

2-Surface area of objects increases

3-Time of contact between objects increases

Notes

-Meteorologists (scientists who study weather) must understand convection and radiation to help them predict the weather

-Engineers must understand conduction, convection and radiation to design new products such as tools of cooking and also

Thermal Insulation and Conductivity

Activity 7

Materials are classified according to the rate of transferring heat into

Thermal conductors	Thermal insulators
(Good conductors of heat)	(Bad conductors of heat)
They are materials that allow thermal energy to transfer through . وهي مواد تسمح بانتقال الطاقة الحرارية من خلالها	They are materials that resist the transfer of thermal energy وهي مواد تقاوم انتقال الطاقة الحرارية
They are materials that allow heat to .travel freely through them	They are materials that slow down .the heat transfer
Example: copper, iron and aluminum	Example Air, plastic, wood and .glass

Thermal insulators cannot prevent the transfer of heat completely, but they .slow down the heat transfer through them

Examples

If you pour hot water into a metal bowl and a plastic bowl, you will notice that

The metal bowl is hot

The plastic bowl is just warm





Metal bowl



Plastic bowl

Because Metal is a thermal conductor, so it allows thermal energy to transfers through

Plastic is a thermal insulator, so it slows down the transfer of thermal - energy



If you touch a metal doorknob, you may feel that it is cooler than the wooden door it is on.

Because your body always generates thermal energy, where

Thermal energy transfers fast from - your hand to the metal doorknob .which is a thermal conductor

Thermal energy transfers slowly from your hand to the wooden door which is a thermal insulator

Exercise on Lesson 3

1- Choose the correct answer:

1- Heat is transferred through solids by…………

a. radiation only *b. conduction and convection*

c. conduction only *d. radiation and convection*

2-Heat is transferred by convection through

a. solids only *b. solids and gases* *c. space only* *d. liquids and gases*

3-Heat is transferred by radiation through

a. solids only *b. solids and liquids* *c. liquids only* *d. gases and space*

4-In the opposite figure, heat transfers between the two metal cubes from cube (……….) to cube (……….) by……….



a. A-B-conduction *b. A-B-convection*

c. B-A-conduction *d. B-A-convection*

5-Metals…………

a. don't allow heat to flow through them *b. allow heat to flow through them*

c. are heat insulators *d. are bad conductors of heat*

6-Meteorologists are scientists who study ,

a. weather *b. rocks* *c. water* *d. cells*

7-Heat transfers from a hot slide in a sunny day to your hand by …….when you touch it

a radiation only *b. radiation and convection*

c. conduction only *d conduction and convection*

8-Heat transfers from an electric heater to your body by………. when you stand near by it

a radiation only *b. radiation and conduction*

c. conduction only *d conduction and convection*

9-Heat is transferred through copper and Iron by…………

a radiation only *b. radiation and convection*

c. conduction only *d conduction and convection*

10-Thermal energy transfers from the Sun to us through the space by…………

a radiation only *b. radiation and conduction*

c. conduction only *d conduction and convection*

11-Thermal insulators…………

a can prevent the transfer of heat completely through them

b. slow down the heat transfer through them.

c. allow heat to travel freely through them

d. increase the speed of heat transfer through them

12-All the following materials are considered thermal conductors, except

a. copper *b. iron* *c. wood* *d. aluminum*

13-When you heat water in a pot, molecules of

.a hotter water move down and that of cooler water move up

.b. hotter water move up and that of cooler water move down

.c. hotter water stop moving

.d. hotter water not be affected

2-Choose from column (B) what suits it in column (A)

(A)	(B)
1-Heat is transferred when you touch a hot metallic ball by	a. Radiation
2-Heat is transferred from the Sun to us through the space by	b. conduction
3-Heat is transferred between molecules of boiling water by	c. Freezing .
	d. convection

1-………….. 2-…………… 3-…………..

3-Put (√) or (X)

1- Heat transfers by conduction through solids only ( )
2-Heat is transferred from the Sun to the Earth through the space by convection ( )
3-Heat is transferred through solids and liquids by convection ( )
4-When you boil water in a pot, hotter water moves up while cooler water moves down( )
5-The speed of heat transfer between objects increases when the difference in temperature between objects increases ( )
6-Meteorologists are scientists who study weather ( )
7-Metals such as copper and iron allow heat to travel freely through them ( )
8-Plastic and wood resist and slow down the heat transfer through them ( )
9-Air and glass can prevent the transfer of heat completely ( )
10-Copper and iron allow heat to travel freely through them ( )

4-Write the scientific term of each of the following

1-The way by which the heat is transferred through solids only (…………….)
2-The way by which the heat is transferred through liquids and gases (…………….)
3-The way by which the heat is transferred through gases and space(…………….)
4-They are scientists who study the weather (…………….)
5-They are materials that allow heat to travel freely through them (…………….)
.6-They are materials that slow down the heat transfer through them(…………….)

5-Cross out the odd word

1-Conduction-Convection-Friction-Radiation
2-Plastic-Copper-iron-Aluminum
3-Air-Copper-Wood-Glass

6-Give reasons for

1-You feel the heat of the Sun, although there is a space between the Sun and Earth
……………………………………………………………………………………..
2-Aluminum and copper are good conductors of heat
……………………………………………………………………………………..
3-Glass and wood are bad conductors of heat
……………………………………………………………………………………..

7-What happens if

1-You touch a hot metal spoon placed in a bot cup of tea
…………………………………………………………………………………….
2-Increasing the time of contact between two cents with different temperature
……………………………………………………………………………………..